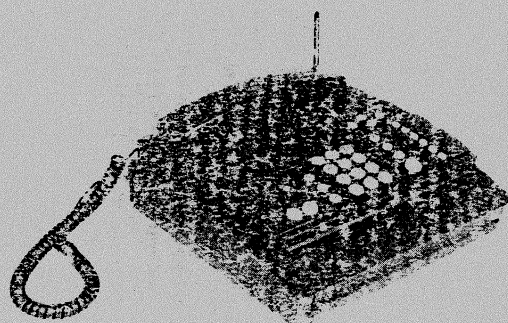


Service
Service
Service

HFC12



Service Manual

HFC12

Is a compact FeaturePhone, an integrated FAX machine and a solid state answering machine (TAM) combined with a "Fax Switch".

It is used as a "Personal Fax" replacing the existing phone without needing more space or additional telephone lines for facsimiles or telephone answering machines.

The HFC12 works also as "base station" for up to six cordless phones (CT1, CT0).

TABLE OF CONTENTS

1. INTRODUCTION	1 - 1
1.1 SAFETY PRECAUTIONS	1 - 1
1.2 SPECIFICATION	1 - 2
1.3 FEATURE TABLE	1 - 4
1.4 DETAILED FEATURE DESCRIPTION	1 - 4
1.4.1 Telephone Features	1 - 4
1.4.2 Fax Features	1 - 5
1.4.3 Automatic Fax Switch	1 - 5
1.4.4 Dialling Features	1 - 6
1.4.5 Cordless Phone Features	1 - 6
1.4.6 Others	1 - 7
1.4.7 TAM Features	2 - 1
2. USER LEVEL OPERATION	2 - 1
2.1 USER FUNCTIONS	2 - 4
2.2 OPERATION ELEMENTS	3 - 1
3. SERVICE LEVEL OPERATION	3 - 1
3.1 ENTERING AND EXITING SERVICE MODE	3 - 1
3.1.1 Service Functions	3 - 2
3.2 ADJUSTMENTS	3 - 2
3.2.1 Modem Test	Function (61)
3.2.2 DTMF Test	Function (62)
3.2.3 Output Level	Function (63)
3.2.4 Frequency Test	Function (64)
3.2.5 Factory Adjustment	Function (65)
3.2.6 Scanner Adjustment	Function (66)
3.2.7 Print Scan Line Reference	Function (67)
3.2.8 OGM Output Level	Function (68)
3.3 RECONFIGURE	3 - 5
3.3.1 Print System Report	Function (71)
3.3.2 Print Service Report	Function (72)
3.3.3 Bitswitch Programming	Function (73)
3.3.4 Set NCU Parameter	Function (74)
3.3.5 Display/Change RAM/ROM	Function (75)
3.3.6 Print RAM/ROM Data	Function (76)
3.4 GENERAL TESTS	3 - 8
3.4.1 RAM Test	Function (81)
3.4.2 KEY Test	Function (82)
3.4.3 LED Test	Function (83)
3.4.4 LCD Test	Function (84)
3.4.5 Speaker Test	Function (85)
3.4.6 Printer Test	Function (86)
3.5 CORDLESS/TCU	3 - 10
3.5.1 General	3 - 10
3.5.2 Cordless Service Functions	3 - 10
3.5.3 Port Test	Function (91)
3.5.4 CTB EEPROM	Function (92)
3.5.5 RF Tests	Function (93)
3.5.6 Final Autotest	Function (94)
3.5.7 TCU EEPROM	Function (95)
3.5.8 TCU Switching	Function (96)
3.5.9 Verify Boards	Function (97)
3.5.10 Set TCU Default	Function (98)
3.6 NCU PARAMETER LISTING	3 - 21
3.7 BITSWITCH LISTING	3 - 21

4. REMOVALS	4 - 1
4.1 REMOVE PAPER HOLDER AND ROMS	4 - 1
4.1.1 Paper Holder	4 - 1
4.1.2 Change ROMs	4 - 1
4.2 PRINTER COVER	4 - 2
4.2.1 Remove Printer Cover	4 - 3
4.2.2 TAM Key Cover	4 - 3
4.2.3 Thermal Printhead (TPH)	4 - 4
4.2.4 Operation Panel Unit (OPU), Rubber Mat, Microphone and LCD Module	4 - 5
4.2.5 Operation Panel Cover	4 - 5
4.3 BOTTOM COVER	4 - 5
4.3.1 Remove Bottom Cover	4 - 6
4.3.2 Scanner Roller	4 - 6
4.3.3 Scanner Unit	4 - 7
4.3.4 Tx Motor, Tx Gears	4 - 7
4.3.5 Glass Plate, LED Array and Mirrors	4 - 8
4.3.6 Document in Sensor (SDI)	4 - 9
4.3.7 Power Control Unit (PCU), Line Access Board (LAB), Telephone Control Unit (TCU)	4 - 9
4.4 TOP COVER	4 - 9
4.4.1 Remove Top Cover	4 - 10
4.4.2 FCU, Paper Out Sensor (SOP)	4 - 10
4.4.3 Loudspeaker	4 - 11
4.4.4 Cordless Telephone Board, RF Module, Antenna	4 - 11
4.4.5 Printer Roller Unit	4 - 12
4.4.6 Rx Motor	4 - 12
4.4.7 Printer Roller	4 - 13
4.4.8 Release Shaft and Release Levers	4 - 13
5. TROUBLE SHOOTING	5 - 1
5.1 ERROR MESSAGES	5 - 1
5.2 SERVICE REPORT	5 - 2
5.3 ERROR CODES	5 - 4
5.4 COPY QUALITY PROBLEMS	5 - 5
5.5 PROBLEMS WITH CORDLESS PHONE(S)	5 - 6
5.6 FUSES	5 - 6
5.7 VARIABLE RESISTORS AND SWITCHES	5 - 6
5.8 SENSORS	5 - 6
6. ELECTRICAL DATA	6 - 1
6.1 BLOCK DIAGRAMS	6 - 3
6.2 BOARD DESCRIPTION	6 - 3
6.2.1 PCB Architecture	6 - 3
6.2.2 Description	6 - 3
6.2.2.1 FCU (Fax Control Unit)	6 - 4
6.2.2.2 LAB (Line Access Board)	6 - 5
6.2.2.3 TCU (Telephone Control Unit)	6 - 6
6.2.2.4 OPU (Operation Panel Unit)	6 - 6
6.2.2.5 PCU (Power Control Unit)	6 - 7
6.2.2.6 PSU (Power Supply Unit)	6 - 8
6.2.2.7 SBU (Scanner Board Unit)	6 - 8
6.2.2.8 CTB (Cordless Telephone Board)	6 - 8
6.2.2.9 RF Module	6 - 9
6.3 WIRING DIAGRAM	6 - 10
6.4 INTERCONNECTION LIST	6 - 10
6.4.1 Connections from FCU	6 - 12
6.4.2 Connections from TCU	6 - 13
6.4.3 Connections from PCU	6 - 14
6.4.4 Connections from OPU	6 - 14
6.4.5 Connections from PSU	6 - 14
7. PARTSLIST	7 - 1
7.1 MECHANICAL PARTSLIST	7 - 1
7.2 ELECTRICAL PARTSLIST	7 - 6

1. INTRODUCTION

1.1 SAFETY PRECAUTIONS

Power supply:

The socket outlet for AC power shall be installed near the equipment and shall be easily accessible. For safety reasons and for EMC protection the device must be earthed.

For safety and for EMC protection only the delivered PSU or one of the following must be used:

40 PS 202 B or W
40 PS 201 B or W
SWA - 24 - PH
SWA - 242 - PH

Lithium battery:

CAUTION

Danger of explosion if the battery is incorrectly replaced. Replace only with same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufactures instructions.

LCD display:

If the LCD display breaks, a slightly caustic liquid may leak out. Avoid contact with eyes and skin!

1.2 SPECIFICATION

ITEM	DATA
Type	Compact transceiver
Telephone Circuit	PSTN/PABX
Document Size	Width: 148 - 218 mm Length: 105 - 600 mm (max. length is service selectable 600, 800, 1000 mm) Thickness: 0,05 - 0,22 mm
Scanning Method	Flat-bed solid state scanner (CCD)
Max. Scanning Width	216 mm ± 1 mm
Effective Printing Width	210 mm (minimum)
Scan Resolution	Standard: 8 × 3,85 dots/mm Fine: 8 × 7,7 dots/mm
Transmission Time	20 seconds (to Memory Fax) (Measured using a CCITT #1 test chart, 9.600 bps, standard resolution, excluded protocol time)
Data Compression Method	MH (Modified Huffman) MR (Modified Read)
Modulation Method	Message: V29, v27ter Protocol: V21
Transmission Data Rate	9600, 7200, 4800, 2400 bps (Automatic fall back)
Protocol	CCITT T.30 standard/T30 new
Printing Method	Thermal printing
Printer Paper Size	210 / 216 mm × 15 m roll
Dimensions	270 × 230 × 85 mm (excl. handset)
Weight	approx. 2,7 kg (excluding handset, paper roll)
Recommended Operating Environment	Temperature: 17 - 28 °C Humidity: 30 - 85 %RH
Power Consumption	Standby ~9 W Transmission ~25 W (black page) Reception 90 W (black page) Copy max. 100 W (black page)
Power Supply	190 - 260 Volts AC, 47 - 53 Hz, single phase; external housing

1.3 FEATURE TABLE

FEATURES	HFC12
Transmission	
Automatic transmission	yes
Manual transmission	After hearing the CED tone, push START.
ADF capacity	1
Automatic contrast control	yes
Polling transmission	To send a document on request of another station.
Send later	yes
Dial via dialpad	yes
Speed dial (one touch)	6
Name dial	app.40
Automatic redial	Last number redial.
Manual redial with redial key	yes
Label programming for Speed Name dials	yes
Page indicator CSI, page	Printed on received page.
Page indicator TTI, page	Printed on received page.
Reception	
Automatic reception	yes
Manual reception	Pushing START.
Polling reception	To call another station and receive a document.
Automatic cutter	no
Authorized reception (with TSI)	yes
Printing TSI on received copies	yes
Communication	
TTI (page header with name)	yes
RTI (own phone number or text)	yes
CSI (own phone number)	yes
Counters (user function)	no
Voice request	yes
PD/DTMF change by userfunction	yes
Modified read (MR)	yes
Compatibility	
CCITT group 3	yes
Copy quality	
Halftone (16 level)	yes
Auto shading correction	yes
Automatic contrast control	yes
Reports	
Transaction confirmation report (Journal)	yes
Transmission report	yes
Speed/Name dial list	yes
Error report	yes
Function list	yes
Unauthorized call report	yes
Telephone features	
Built-in handset	yes
On-hook dial *1	yes
Monitor speaker *1	yes
Redial (last number)	yes
12 key dialpad	yes
Volume control for speaker *1	yes
Volume control for ringer *1	yes
Power down function (ring, dial, speech)	yes
PSTN access from PABX *2	yes
Transfer inside PABX *2	yes

NOTES: *1: Not possible in power down mode

*2: Common PABX only

FEATURES	HFC12
Cordless phone features	
Operating range	150 m free field
Auto security code (ID)	changeable
Last number redial	1 number
Listen in (call monitoring)	Only from handset (for privacy).
Intercom	Cordless handset to base (and vice versa).
Multiple handsets	Up to 6 pieces.
Ringer type	selectable
Battery	NiCd-accu
Charging time	CT0: 6 hours; CT1(+): 6 hours
Usage time with full battery	CT0: 6 hours; CT1(+): 6 hours
Stand by mode	CT0: 60 hours; CT1(+): 30 hours
Intercom ring	Priority is selectable.
Key touch tone	on/off
Microphone muting	Cordless handset and fax machine.
Remote functions (on line)	TAM call screening: start fax reception.
Call transfer	From fax machine to cordless handset and vice versa from cordless to cordless.
Number memory	10 numbers (23 digits)
Line status indication	LED blinks and busy tone sounds.
Interchangeable antenna	CT0: soft, telescopic-metal CT1: soft
FAX/PHONE switch	
Automatic FAX/TEL/TAM switch	No ring if receiving fax messages.
Speech generation (AVM)	During CNG check the caller hears a message.
Interfaces	
Line out connector *3	To connect other machines on the same tel line.
TAM features	
Full digital TAM	10 min. speech memory.
Remote operation	To switch on/off TAM features via remote operation.
Call screening (break through)	ICM can be monitored.
Skip messages	yes
Erase one/all messages	yes
2nd OGM	Played after recording ICM.
Memory extension	A service center
Forwarding calls	yes
Time date stamp	yes
Room monitoring	yes
Baby sitter function	yes
Others	
Copy mode (normal, fine, photo)	yes
Time indicator	yes
Clock adjustment	yes
LCD display prompt	yes
LCD size	1x16
Battery buffered RAM size in kByte	64
ROM size in kByte	512
Service features	Only in available in service mode.
Remote diagnostics	yes
Printer test pattern	yes
Bit switch setting	yes
ROM/RAM data display/list	yes
NCU parameter setting	yes
Service report	yes
System parameter list	yes
TCU/CTB programming	yes

NOTE: *3: Not at all countries

1.4 DETAILED FEATURE DESCRIPTION

1.4.1 Telephone Features

ON HOOK DIALLING

Handset stays on hook while dialling; the transmission built up can be heard; free speaking is possible.

LISTEN IN

On HOOK is also used to switch on the monitor speaker while making a call so that other people in the room can listen to the phone conversation.

RECALL

To get access to the PSTN line in PABX systems ("earth" or "time break" function) or to transfer a call within PABX systems.

REDIAL

Repeat the last dialled phone number (only in power on mode !).

1.4.2 Fax Features

POLLING RECEPTION

A fax message can be fetched automatically from another station (the other station has to prepare a message to be fetched).

POLLED SENDING

A prepared fax message will be sent automatically when another station calls for it (with a polling receive request).

AUTO CONTRAST CONTROL

The contrast (= intensity difference between the text and the background) is adjusted automatically.

TRANSMISSION MODES

standard: standard resolution, 3,85 lines/mm

fine: increased resolution, 7,7 lines/mm for transmission of detailed drawings or small characters

photo: 16 grey levels, fine resolution mode

PAGE HEADER

User phone number, name, time/date and page number are printed on each fax that will be transmitted.

PAGE FOOTER

TSI (Transmitting Subscriber Identification), time/date and page number are printed on the bottom of each received page.

AUTHORIZED RECEPTION

Every stored number is authorized to send a fax to the users machine, once a fax has been sent to that numbers. This helps to prevent that unwanted fax messages can be send to the users machine (junk fax).

COMPRESSION MODE

Modified Huffman: method to reduce the data transferred via the telephone line. All G3 machines offer MH-coding.

Modified read: more efficient coding system that increases speed by about 15%. MR is not available on cheap G3 machines.

1.4.3 Automatic Fax Switch

TEL - MODE

Telephone mode; behaves like a normal telephone basically used for telephone calls only, a fax can be received:

- by pressing START (if the handset is lifted)
- with DTMF code from external or cordless phone (default: * 5)

TEL/FAX - MODE INTERNAL

Telephone/fax mode;

When a call comes in, the fax machine takes the line after the first ring (first ring is muted).

The fax switch activates the CNG detection, in parallel it starts playing a voice prompt (or a ring signal).

If a CNG signal is detected fax reception is started.

If no CNG signal is detected within a few seconds the internal bell starts ringing.

If no CNG signal is detected and the handset is not lifted within a certain number of rings (user selectable)

fax reception is started in order to receive fax messages from silent machines.

There is no silence detection in this mode!

TEL/FAX MODE EXTERNAL

Telephone/fax mode with external telephones connected. If a call comes in and the handset of an external telephone is lifted, CNG and silence detection is started.

If no handset is lifted, FAX reception starts after a certain number of rings (number depends on settings in function 33 in TAM mode).

To start FAX reception from external or cordless telephone, use:

- DTMF code (default * 5)
- silence detection (cover up the mouthpiece of the external phone and the FAX will switch to receive)

TAM/FAX - MODE INTERNAL

Telephone answering machine/fax mode. TAM answers the calls; fax messages are printed out automatically.

When a call comes in the fax machine takes the line after the first ring (first ring is muted) and activates the CNG detection.

If no CNG signal is detected within a few seconds the internal bell starts ringing.

If a CNG signal is detected fax reception is started.

If no CNG signal is detected and the handset is not lifted within a certain number of rings (user selectable)

OGM1 play back is started.

After OGM1 play back silence and CNG detection takes place, and the caller is asked to record ICM.

If silence or CNG is detected the fax will switch to receive.

TAM/FAX - MODE EXTERNAL

Telephone answering machine/fax mode with external phone(s) connected to the same telephone line.

TAM automatically answers the calls if a fax arrives the fax will switch to receive.

After the machine took the line, CNG detection is activated.

After a certain period (depends on NCU #26) OGM1 is started. If a single CNG is detected during this time

OGM1 start is delayed about 4s.

If two full CNG cadences are detected fax reception is started.

During ICM record the machine detects also for silence in order to receive fax messages from silence machines.

VOICE PROMPTS

Only in TEL/FAX and TAM/FAX mode; preprogrammed messages will be automatically played while the machine is checking for CNG-tone (for instance: "please hold").

1.4.4 Dialling Features

SPEED DIAL

Special key under which the user programs a phone number and the name belonging to the number.

By pressing this key the fax machine automatically recalls the number and it dials automatically when ON HOOK is pressed or the handset is lifted. 6 keys are available.

NAME DIAL

Names + phone numbers can be stored in the memory and recalled by pressing the first alpha numeric character of the wanted name by means of the dial pad. (50 entries with 8 characters and 15 digits)

1.4.5 Cordless Phone Features

ABBREVIATED DIALLING

Up to 10 telephone numbers which are often used can be stored in the memory of the cordless handset.

By pressing a one digit code the required telephone number will be dialled automatically.

LISTEN IN

With the ON HOOK key the monitor speaker on the fax machine can be switched on while making a call so that other people in the room can listen to the phone conversation.

RECALL

To get access to the PSTN line in PABX systems ("earth" or "time break" function) or to transfer a call within PABX systems.

INTERCOM FUNCTION

It is possible to use the fax machine with the cordless phone(s) as a home communication system.

The user can make calls between a cordless handset and the fax machine.

REDIAL

To repeat the last dialled phone number.

MUTE

By pressing and holding down a function key during conversation, the microphone can be switched off.

The microphone signal is no longer blocked when the key is released.

LOW BATTERY ALARM

When the battery strength becomes low during a conversation a tone will sound.

OUT OF RANGE ALARM

If the handset approaches the limit of the effective operating distance from the fax machine during a conversation a tone will sound.

1.4.6 Others

ROOM MONITORING

After remote operation via access code the user can phone his fax machine in order to listen to what is happening in the room where the fax is connected to the telephone line.

BABY SITTER FUNCTION

One special number can be entered and will be dialled automatically if the handset is lifted and any key of the machine has been touched. There is no possibility to dial any other phone number, unless the usage code is entered.

NOTE BOOK FUNCTION

Phone number (SPEED or NAME number) can be stored **during** a telephone call.
The user has also access to the stored numbers in the **NAME** entries.

1.4.7 TAM Features

FULL DIGITAL TAM

Messages are recorded with solid state devices, no tape is used for recording.

REMOTE CONTROL

Via TONE dialling or with an optional TONE box the recorded messages can be played back from any place you want.

REMOTE ACCESS CODE

The user can initialize a four digits code in order to get access to the TAM messages when using the tone dialling or tone box remote control.

CALL FORWARDING

Incoming messages are automatically forwarded to a preprogrammed telephone number.

CALL SCREENING

The incoming message can be monitored by the loudspeaker. If appropriate the phone can be picked up to answer the call.

SHORT MESSAGE

Caller hears outgoing message from TAM and decide to terminate the call.
Result: TAM goes on hook and is in stand by again.

EMPTY MESSAGE

Caller hears outgoing message from TAM and does not leave any message, the TAM treats this as no incoming message and skips the call.

MEMO MODE

The internal memo mode is used to leave a private message. This can be played back as a normal message.
With the external memo mode a caller hears the message (may fill the complete memory).
No messages can be recorded.

BREAK TROUGH CODE

Only to be used with TONE dialling device or TONE box. The user gives an access code to selected persons.
When entering this code while the TAM is playing the outgoing message, the internal ringer of the faxmachine is activated. The user can decide to answer the call now.

AUTOMATIC FALL BACK TO TEL/FAX MODE

If in TAM/FAX mode and TAM is full, machine switches automatically into TEL/FAX mode, to allow remote operation.

2. USER LEVEL OPERATION

2.1 USER FUNCTIONS

1 SET UP

NR	FUNCTION NAME	DESCRIPTION
11	Set Date/Time	To adjust the internal clock to the current date and time. Date/time are shown on the display in idle state. This function is automatically invoked at power on and when battery is low.
12	Your Tel. Nr.	This number (CSI) is transmitted within the page header.
13	Your Name	This name is transmitted within the page header.
14	Dial Mode	To set dialmode and PABX operations.
15	Fax Journal	To print out a list with the last 10 fax sendings/receivings - print now: yes/no
16	Set Language	Set language for display messages.
17	Page Header	The page header line consists of "Your Number" and "Your Name" and is printed on every transmitted page - page header: on/off - location: inside/outside image
19	Usage Code	Dialling is only possible after entering the usage code: - INT: international calls are not possible - NAT: national calls are not possible (only local calls possible) - TOT: when pressing any key a preprogrammed phone-number will be dialled ("baby sitter mode") - enter number for baby sitter mode - enter usage code

2 COMMUNICATION

NR	FUNCTION NAME	DESCRIPTION
21	Auth. Reception	Reception is only possible from speed/name dial numbers - auth. rec.: on/off
22	Slow (4800 bps)	set half speed transmission - 4800 baud: on/off
23	Send Later	Document will be send later (within the next 24 hours) - enter time to send
24	Polled Reception	To call another station and receive a document.
25	Polling Send	To send a document on request of another station.
26	Fax Autostart	To start transmission when CED is detected - auto start: on/off
27	New Number	F: To switch to the new dialmode.

3 FAXSWITCH

NR	FUNCTION NAME	DESCRIPTION
31	Voice	Pre-programmed messages will be played automatically while the machine is checking for CNG-tone - voice: yes/no
32	Language	To change language of pre-programmed messages - Lang. 1 - Lang. 2
33	Ring Count	To set ring count in TEL/FAX and in TAM/FAX mode - TEL/FAX - TAM
34	Silence Time	To select the silence detection time for the faxswitch - TAM/FAX: off...15s
35	External Phone	- ext.phone: yes/no - ring count - silence - FAX DTMF

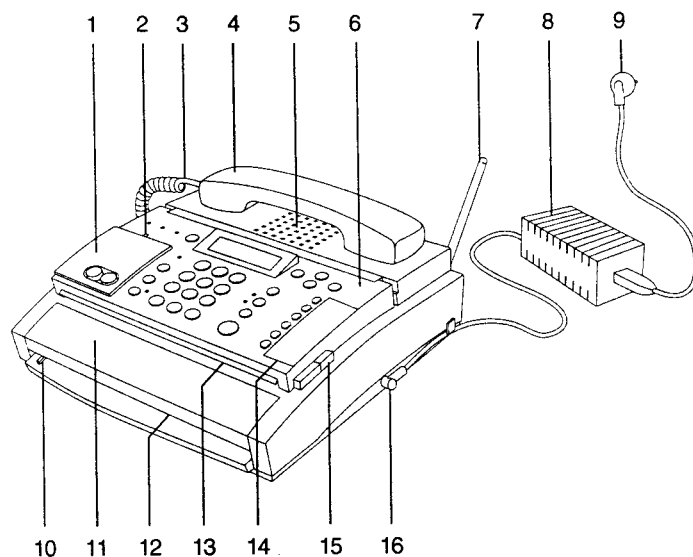
4 ANSWERING DEVICE

NR	FUNCTION NAME	DESCRIPTION
41	Record Time	To limit the recording time for incoming messages - recording time: 30s, 60s, 120s, AUTO (unlimited)
42	Time/Date	To mark incoming messages with the date and time - time stamp: on/off
43	Access Code	To enter the access code for remote control - enter code
44	Break Trough Code	Callers can overrule the answering machine by entering this code - enter code
45	Memo Mode	To leave private messages (internal) or public messages (external).
46	Forwarding	To automatically send incoming messages to another tel. number - enter number where to forward - enter message packet size

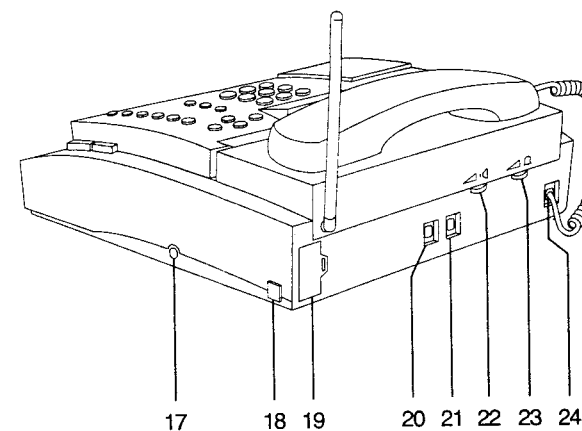
5 OTHERS

NR	FUNCTION NAME	DESCRIPTION
51	Transmission Report	Transmission confirmation printed after every transmission - report: on/off
52	Dialling List	To print out a list of all stored numbers (speed dial and name dial).
53	Ringer Types	To select out of 5 different ringer types.
54	Key Touchtone	Key touch tone can be switched on and off.
55	Remote Operation	To enable remote diagnostic access (default: disable).
56	Hands. Ringing	To program the priority of ringing between cordless handsets and fax machine. - ring all? - ring fax only? - ring cordless?
57	Intercom Ring	To switch on/off the ringing of base station (fax machine) at intercom operation - ringing: on/off
58	Match Handset	To install a cordless phone to the base station (fax machine). At this operation the CTB ID code and the CTB country code are transmitted to the cordless handset. If LOCKING BASE is set, also the entered PIN code is stored in the CTB EEPROM and also in cordless handset EEPROM. - match code
59	Del. Handset	To delete a matched cordless handset out of the SRAM contents. - cordless number

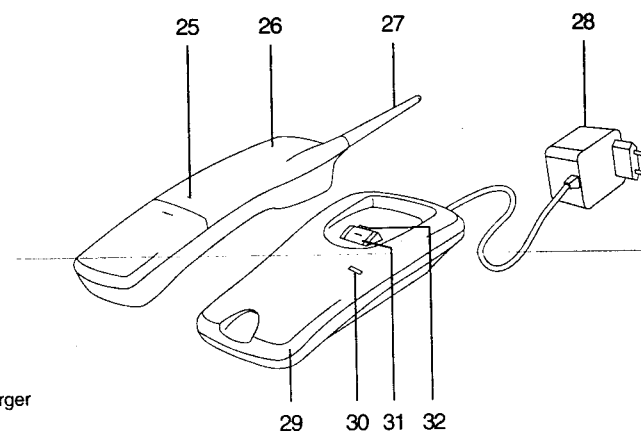
2.2 OPERATION ELEMENTS



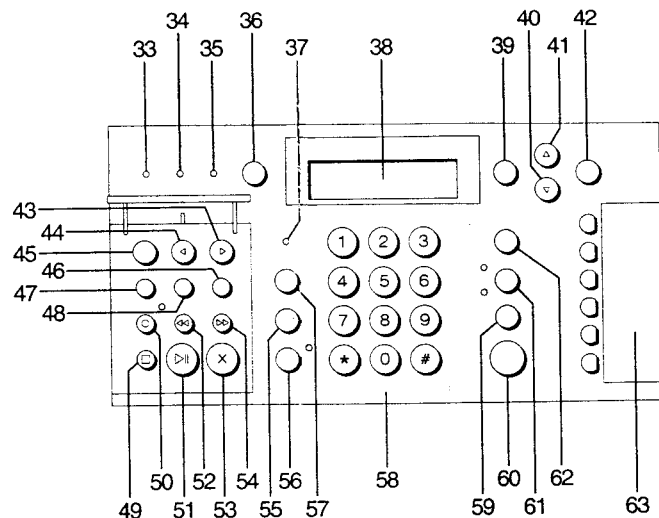
1. TAM key cover
2. Microphone
3. Handset cord
4. Handset
5. Loudspeaker
6. Paper cover
7. Antenna
8. Power supply unit
9. Power cable
10. Document guide
11. Scanner cover
12. Feed slot
13. Paper tear strip
14. Card for names and numbers
15. Release knob
16. Cable Power supply unit - fax machine



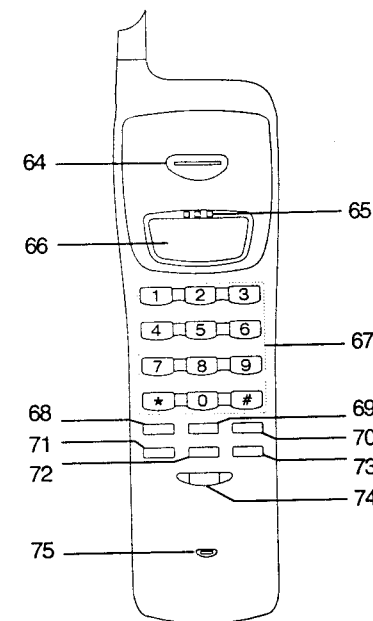
17. Connection socket
18. Cable clamp
19. Battery compartment
20. LINE: Connection socket for telephone cable
21. LINE OUT: Connection socket - for connection of external devices; not for all countries
22. Volume-control of the built in loudspeaker
23. Volume-control of the built in ringer
24. Connection socket for handset



25. Loudspeaker
26. Cordless handset
27. Antenna
28. Power supply for charger
29. Charger
30. Charging LED
31. Bracket for wall fastening
32. Loading contacts



- 33. Indicator LED TAM/FAX: shows actual mode
- 34. Indicator LED TEL: shows actual mode
- 35. Indicator LED TEL/FAX: shows actual mode
- 36. MODE - Key: to change mode
- 37. "ERROR" indicator LED
- 38. Display
- 39. NAME - Key: to invoke programming or using the name dialling
- 40. CURSOR-DOWN - Key: to search through the name entries
- 41. CURSOR-UP - Key: to search through the name entries
- 42. STORE - Key: to store names and numbers
- 43. CURSOR RIGHT - Key: to move the cursor or to select a function
- 44. CURSOR LEFT - Key: to move the cursor or to select a function
- 45. FUNCTION - Key: to choose a function
- 46. CLEAR - Key: clears alphanumeric input and numbers
- 47. SELECT - Key: to select options
- 48. OK - Key: to confirm any input during programming
- 49. STOP - Key: to abort any operation START/COPY - Key: to start transmission/copying
- 50. RECORD - Key with indication LED: to record messages
- 51. PLAY/PAUSE - Key: to play messages; key blinks if new messages arrived
- 52. SKIP BACK - Key: currently played message will be repeated
- 53. CLEAR - Key: to delete messages
- 54. SKIP FORWARD - Key: next message will be played immediately
- 55. REDIAL - Key: to redial the last number or to enter a dial-pause
- 56. ON HOOK - Key with indicator LED: for handsfree dialling (on-line, monitorspeaker)
- 57. RECALL (R) - Key: to get access to the PSTN line in PABX operation, or to transfer a call within PABX systems
- 58. Dialling keypad: to enter numbers and characters
- 59. STOP - Key: to abort any operation
- 60. START/COPY - Key: to start transmission/copying
- 61. RESOLUTION - Key and indicator LED's: to select and indicate fine resolution and photo mode
- 62. INTERCOM/TRANSFER - Key: for intercom operation or to transfer a call
- 63. SPEEDDIAL - Keys: to dial a number with one key-press



- 64. Loudspeaker of cordless handset
- 65. Loading contacts
- 66. Sight glass
- 67. Dialling keypad
- 68. SHORT DIAL - Key: to program short coded numbers
- 69. ON HOOK - Key: to switch on the loudspeaker from the fax machine
- 70. INTERCOM/TRANSFER - Key: for intercom operation or to transfer a call
- 71. PROGRAM/MUTE - Key: for programming and to switch off the microphone
- 72. RECALL (R) - Key: to get access to the PSTN line in PABX operation, or to transfer a call within PABX systems
- 73. REDIAL - Key: to redial the last number or to enter a dial-pause
- 74. TALK - Key: to initiate/receive a telephone call with the cordless handset
- 75. Microphone of cordless handset

3. SERVICE LEVEL OPERATION

3.1 ENTERING AND EXITING SERVICE MODE

To enter service mode:

press: START, STOP, START, STOP within 3 seconds
(STOP has to be the last key, else a 5 cm paper cycle is executed !)

→ Rightmost character in display changes into a black block to indicate service mode.

→ **NOTE:** The service functions are available in service mode only !

To exit the service mode:

After time-out (40 seconds), the system will switch SERVICE MODE off.

NOTE: For service functions the keys CURSOR LEFT/RIGHT, SELECT, OK, #, *, START, STOP and the DIAL KEYPAD are used.

3.1.1 Service Functions

6 ADJUSTMENTS

NR	FUNCTION NAME	DESCRIPTION
61	MODEM Test	To check the correct function of the modem-chip (external measuring instrument needed).
62	DTMF Test	To check the correct function of the telephone microcontroller (external measuring instrument needed).
63	Output Level	To define the output-level (in 1dB steps). Range: 0...-15dB
64	Frequency Chk	To generate and output a sine wave with selectable frequency (100 Hz steps) at the defined output level.
65	Factory Adj.	1.) To check software and country version. 2.) To set correction value for the output level (external measuring instrument needed). 3.) To make a SRAM clear and reset (all RAM contents are set to default).
66	Scanner Adj.	Used to check the correct function of the LED-array.
67	Print Scan Ref	Used to check the scanner and the LED-array.
68	OGM Level	Used to adjust the output level of the TAM-OGM (in 0.1dB s

7 RECONFIGURE

NR	FUNCTION NAME	DESCRIPTION
71	System Report	Prints out the current system parameters. Used before changing battery or replacing FCU.
72	Serv. Report	Prints out the most recent 15 error codes.
73	Set Bitswitch	Used to change bit-switch settings.
74	NCU Parameter	Used to adjust parameters for dialling and timing detection.
75	Change Memory	Used to check or change the RAM/ROM contents.
76	Print Memory	Used to print out a certain memory area.
77	Display Flags	FACTORY USED ONLY
78	Display Rings	FACTORY USED ONLY
79	Display Tests	FACTORY USED ONLY

8 GENERAL TESTS

NR	FUNCTION NAME	DESCRIPTION
81	RAM Test	To test correct function of RAM.
82	KEY Test	To test correct function of all keys.
83	LED Test	To test correct function of all LED's.
84	LCD Test	To test correct function of the LC-Display.
85	SPEAKER Test	To test correct function of built in speaker.
86	PRINTER Test	To test correct function of the thermal head.

9 CORDLESS/TCU

NR	FUNCTION NAME	DESCRIPTION
91	PORT Test	FOR APPROBATION USE ONLY
92	CTB EEPROM	To read/write or print the contents of the CTB EEPROM (country specific cordless telephone parameters).
93	RF Test	FOR APPROBATION USE ONLY
94	FINAL AUTOTST	FACTORY USED ONLY
95	TCU EEPROM	To read/write or print the contents of the TCU EEPROM (country specific telephone parameters).
96	TCU SWITCH	To switch on/off different analog path combinations.
97	VERIFY BOARDS	To check if CTB and TCU have the same country version, and the correct EEPROM contents (used after board replacement).
98	SET TCU DEF.	To write all country specific parameters into the TCU EEPROM (internal table of these parameters will be written into the TCU).

NOTE: Do not use service functions 77, 78, and 79; they are only for factory use. If used, the machine might do a SRAM clear !

3.2 ADJUSTMENTS

3.2.1 Modem Test - Function 61

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 61, then press "OK".
3. By pressing the keys * and # the user can define which signal is output by the modem chip.
The LCD shows the specified frequency or baudrate. (9600,7200,4800,2400,300 Baud 2100,1100 Hz)

3.2.2 DTMF Test - Function 62

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 62, then press "OK".
3. By pressing one of the numeric keypad keys (0-9,* and #) the user can define which DTMF signal will be sent out by the telephone microcontroller. The DTMF signal is also sent to the speaker.
To get a continuous DTMF tone switch the machine off, lift the handset and press the requested key(s).

3.2.3 Output Level - Function 63

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 63, then press "OK".
3. By pressing the keys * and # the user can define the output level (in 1dB steps), which is also shown on the right corner of the LCD and is stored immediately.
Range: 0 ... -15dB

3.2.4 Frequency Test - Function 64

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 64, then press "OK".
3. This function can be used to output a definable frequency (100 Hz steps) at the defined output level.
The required frequency can be changed by pressing * and # on the numeric keypad.

3.2.5 Factory Adjustment - Function 65

NOTE: Make a print out of the system report (service function 71) and the dialling list (user function 52) before doing a RAM clear !

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 65, then press "OK".
The LCD display shows "Vx.xx dd.mm.yy c".
(x .. software version, d .. day, m .. month, y .. year, c .. country)
By pressing "START" the display shows "O.LEV RAMC".
- 3.1 "O.LEV" means set correction value for output level:
With LEFT and RIGHT Key you are able to adjust the correction value for the output level (Range: 1..255).
- 3.2 "RAMC" means RAM clear:
Press the RIGHT key, then press START. A soft reset is performed, which includes a whole ARAM test and a SRAM clear. After a reset all soft bitswitches are set to the initial values.

WARNING!

The complete RAM will be cleared, so all speed dial and short dial numbers will be erased.

3.2.6 Scanner Adjustment - Function 66

Use this function to check the correct function of the scanner LED array.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 66, then press "OK".
3. The scanner illumination (LED array) is on. Press STOP to switch the LED array off again.

3.2.7 Print Scan Line Reference - Function 67

Use this function to check the scanner and the LED array.

Whenever a document is inserted, the white line adjustment is performed using the scanner roller as the white reference (shading correction). Make a test copy first to initiate updating of the scan line reference data.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 67, then press "OK".
3. The reference line is printed. This is a diagram of the correction values which are used for the auto shading correction. If the line comes close to the top level or if there are significant peaks it indicates problems with the LED array, optical system or CCD. Clean the scanner roller, the mirrors and the lens (do not open the lens holder !), replace the LED array or the Scanner Unit. Test scanner performance by making a test copy in photo mode. There shall not be significant vertical dark stripes.

3.2.8 OGM Output Level - Function 68

Use this function to adjust output level of the OGM's.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 68, then press "OK".
3. Press the keys * and # to adjust the output level (in 0,1dB steps).
The value is also shown in the right corner of the LCD and is stored immediately.
Press START, the OGM1 is played until key * or # is pressed again. STOP ends the function.

3.3 RECONFIGURE

3.3.1 Print System Report - Function 71

This function is used to print the actual system parameters like, page header (TTI), fax number (CSI), ROM version, CCITT number, Maker code, Bit switches and NCU parameters. Use this function in case of battery change or (if possible) before repairing or replacing the FCU and to refill the system parameters.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 71, then press "OK".
3. The system report list will be printed now.

e.g.:

SYSTEM REPORT

```
YOUR NAME:      Philips
YOUR TEL. NR.:  +43 1 60101
ROM VERSION:    V0.17 1A 17.10.94 11:36 D 020 12 1 - A1 L10
TCU VERSION:    V02 D F
CTB VERSION:    V0.5 B9 00
CCITT/MAKER:    10/1
OUTPUT LEVEL:   -09DBM
```

```
BITSWITCH  DEFAULT  ACTUAL
00  00000010  00000010
01  00000000  00000000
0F  00000000  00000000
```

```
NCU PARAM.  DEFAULT  ACTUAL
0/00       42/2A   42/2A
1/01       150/96  150/96
66/42      90/5A   90/5A
```

- column "ROM VERSION" means:

e.g.:	SW-Version	Country Set	Date	Time	TCU-Country	OPU-configuration	Factory code	Aram-amount	TCU-code
	V0.17	1A	17.10.94	11:36	D	0ab yy z	-	A1	L10

a.... model
b.... OPU code
yy... OPU id
z.... COP revision

- column "TCU VERSION" means:

e.g.:	SW-Version	Dialmode	"R" Key
	V02	D (DTMF)	F (TIME BREAK)
		P (PULSE)	E (EARTH)

- column "CTB VERSION" means:

e.g.:	SW-Version	CT	Country code
	V0.5	B8 = CT0	00 (international)
		B9 = CT1(+)	

3.3.2 Print Service Report - Function 72

The service report prints the most recent 15 error codes. The Error Code column indicates which malfunction happened.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 72, then press "OK".
3. The service report list will be printed now.

For the meaning of the error codes see section 5.3.

3.3.3 Bitswitch Programming - Function 73

Use this function to change a bit switch setting. The bit switches are explained in section 3.6.

WARNING

Do not change a bit switch that is described as "not used" as this may cause the machine to malfunction or to operate in a manner that is not accepted by local regulations.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 73 (SET BITSWITCH is displayed), then press "OK".

3. Display shows: BSW: nn xxxxxxxx
(cursor blinks under nn)

nn Bitswitch address, starts with 00(HEX)
xxxxxxx value field; each x stands for a single bit of setting (0=not set, 1=set)

bit-number: 7 6 5 4 3 2 1 0 (Example: BSW: 07 01010101 means,
position: x x x x x x x x that Bitswitch 7, bits 0,2,4,6 are set)

4. Enter the required bit switch address via the numeric keypad.
(e.g.: 07 in above example).
Use the * or # keys to increment or decrement the address.
5. Use SELECT key to move from address field to value field.
To change a certain bit use the numeric keypad - just type its position number now.

NOTE: If the bit was initially (before setting) "1", it's now "0" and vice versa.
Press SELECT key to switch back to address field.

6. Press "OK" to exit this function, followed by STOP.

3.3.4 Set NCU Parameter - Function 74

Use this function to adjust parameters for timing detection and dialling. The NCU parameters are explained in section 2.8.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 74 (NCU PARAMETER is displayed), then press "OK".
3. Display shows: NCU: nn xxx
 (Cursor blinks under nn)

nn... NCU parameter address, starts with 00 (HEX)
xxx decimal value setting of NCU parameter nn
Example: NCU:1F 010, means that NCU parameter 1F is set to decimal(!) value 10.

4. Enter NCU parameter address in hex via the numeric key pad (to enter the letters from A to F use the speed dial keys !). Use the * or # keys to increment or decrement the address.
5. Use SELECT key to move from address field to value field and change the desired value (in decimal) via the numeric keypad. Press SELECT key to switch back to address field.

NOTE: Changing the value is immediately accepted, no way to return to previous value if mistyped !

6. Press "OK" to exit this function, followed by STOP.

3.3.5 Display and Change RAM/ROM - Function 75

Use this function to check the ROM/RAM and to change the RAM contents.

WARNING !
Do not make any change in RAM! This may cause the machine to malfunction!
This function is for factory use only!

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 75, then press "OK".
3. The LCD shows the actual address and the contents of this address (data field) in hexadecimal value. Use the LEFT and RIGHT keys to control the cursor. To switch over from the address to the data field use the SELECT key. With the keys 0 - 9 on the numeric keypad and the SPEED DIAL keys A - F the address and data field can be modified (all input values are hexadecimal). With the * and # keys on the numeric keypad the address can be increased or decreased. Use the "SELECT" key to leave the data field. When in the address field use the OK key to terminate this function.

3.3.6 Print RAM/ROM Data - Function 76

Use this function to print a certain memory area.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 76, then press "OK".
3. First enter the start address and after pressing "OK" edit the end address. Use the keys 0 - 9 on the numeric keypad and the SPEED DIAL keys A - F to enter the hexadecimal address range. Press OK; the selected memory area will be printed now.

3.3.7 Display Flags - Function 77: for factory use only !
Display Rings - Function 78: for factory use only !
Display Tests - Function 79: for factory use only !

NOTE: Do not use service functions 77, 78 and 79. They are only for factory use.
If used, the machine might do a SRAM-clear !!

3.4 GENERAL TESTS

3.4.1 RAM Test - Function 81

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 81, then press "OK".
3. The RAM is tested by writing 55h to RAM, shift left 1 bit and check with AAh if it is correct or not. The RAM test does not destroy the contents of the RAM. If an error occurs the message "RAM ERROR AT xxxxxx" is displayed for 3 seconds and the message "RAM TEST ERROR" is printed. If no error is found, the message "RAM TEST OK" is printed.

NOTE: In this function the SRAM is tested only. The ARAM is always tested at power up!

3.4.2 KEY Test - Function 82

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 82, then press "OK".
3. You are requested to press the keys of the control panel in a certain sequence. The LCD indicates the key to be pressed. The test is finished when the last key (the START key) is pressed. If all keys have been pressed correctly, the message "KEY TEST OK" is printed, otherwise the message "KEY TEST ERROR" is printed.

3.4.3 LED Test - Function 83

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 83, then press "OK".
3. All the LED's on the control panel are lit one after another in certain sequence. The user has to check if all LED's are OK. If all LED's are working correctly press START. The message "LED TEST OK" is printed. If one of the LED's is defective press STOP, the message "LED TEST ERROR" is printed.

3.4.4 LCD Test - Function 84

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 84, then press "OK".
3. Check if all the dots of the LCD are switched on. Press STOP if one of the dots is defective, the message "LCD TEST ERROR" is printed. If all dots are correct press START, the message "LCD TEST OK" is printed.

3.4.5 Speaker Test - Function 85

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 85, then press "OK".
3. Now the speaker sounds. Press STOP if the result is not OK, the message "SPEAKER TEST ERROR" is printed. Press START if the result is correct, the message "SPEAKER TEST OK" is printed.

3.4.6 Printer Test - Function 86

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 86, then press "OK".
3. A test sheet with horizontally and vertically lines will be printed.

3.5 CORDLESS/TCU

3.5.1 General

After power on or exiting the cordless test functions, a reset command sequence is sent to the Cordless Telephone Board (CTB). If there is no proper response from the CTB the message CORDLESS ERROR / PRESS STOP is displayed until STOP is pressed.

The cordless error shows that there are some disturbances in the FCU/CTB communication. In case of a cordless error it is useful to start the service mode by entering any cordless service function. If there is no response from the CTB at all, the display shows alternating WAITING.../ OR PRESS STOP until STOP is pressed; then CORDLESS ERROR is displayed again.

Reasons for cordless error:

- no or bad connection between FCU and CTB
- failure in CTB programming
- defective FCU
- defective CTB
- no or bad connection between TCU and CTB

3.5.2 Cordless Service Functions

After entering service functions 91, 92 or 93 the CTB service mode is started and at the same time the CTB software version is displayed a few seconds in the form of: **Vxx By**

Vxx: Software version
B: Base software
y: 8 = CT0 9 = CT1 or CT1+

3.5.3 Port Test - Function 91 *For approbation use only !*

3.5.4 CTB EEPROM - Function 92

The Cordless Telephone Board (CTB) EEPROM has 256 bytes. Some of these bytes specify the functionality of the cordless parameters.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 92, then press "OK".
3. The display shows : CTB EEPROM:RD/RW

Use the cursor left/right keys to switch between read/write, print and unlock. To enter one of these options press the cursor keys until the desired option appears in the display, then press OK.

Unlock

If the EEPROM is locked only the first 32 bits can be changed. To be able to change the whole EEPROM contents this function must be used previously. After entering this option the display shows: CTB CMD OK for a few seconds. Now the whole EEPROM range can be changed. After exiting the Cordless/TCU service functions the EEPROM is locked automatically.

Read/write

After entering this option the display shows: EEPROM A:00 ("A" = address)
 Enter the desired address then press "OK".
 The display shows: EEPROM A:xx D:xx ("A" = address; "D" = data;
 "xx" = value of address/data)

Now the content of the address can be overwritten by using the dial keypad to enter a new value.
 If the new value is correct the system switches to the next address. To switch to the next address without changing the showed value use the OK key. Press STOP to exit this function.

Print

After entering this function the contents of the whole CTB EEPROM is printed.
 To stop the procedure at any time press the STOP key.

Important CTB EEPROM data:

ADDRESS	DESCRIPTION	VALUE (hexadecimal)
00	to (un)lock the bytes from address 32 to address 256	FD = locked FF = unlocked
01-03	CTB ID code	Do not change.
04-05	Personal Identity Number (PIN) (match-code)	00 00 = handset matched but code is not locked. Use this function to find out the locked match code.
06	Ringling priority (reflects settings made in user function 56)	00 = fax machine 01..06 = number of cordless handset FF = equal
07	EEPROM validity control	Do not change.
08	Checksum of lower range	Do not change.
20	Product code	For internal use only.
21	Country code	00 = international (for CT1 and CT1+) 02 = Germany 03 = Netherlands 04 = Norway 05 = United Kingdom 06 = Switzerland 07 = Ireland 08 = Italy 09 = Austria 10 = Belgium 13 = Sweden 14 = Finland 15 = Greece 16 = Spain 17 = Portugal 19 = France 20 = Denmark
22	Software bitswitch (1 = on 0 = off)	bit 0: 6 cordless handsets allowed bit 2: E: listen in function e.g.: (6 cordless handsets allowed; listen in function for Spain = off) bitmask: 0000 0001 --> value = 01

ADDRESS	DESCRIPTION	VALUE (hexadecimal)
23-24	If there is no response of the fax machine during intercom connecting within this time the handset goes offline and vice versa.	100 ms / unit 00 00 is not allowed
25	Transfer ringing duration.	100 ms / unit
26	Transfer return ringing duration.	100 ms / unit
30	Radio configuration	CT0: 00 = NL; 01 = E; 02 = F CT1: bit 0 = 0....40 channels bit 0 = 1....20 channels bit 1 = 0....CT1+ bit 1 = 1....CT1
31-32	Handshake period	10 ms / unit
33	Activate sending duration	100ms / unit CT0: 2,5 s CT1: 3 s
34	RSSI free level	Do not change.
35	RSSI out of range level	Do not change.
36	Out of range time before release.	2 s / unit CT0: 9 (=18 s) CT1: 5 (=10 s)

3.5.5 RF Tests - Function 93 *For approbation use only.*

3.5.6 Final Autotest - Function 94 *For approbation use only.*

3.5.7 TCU EEPROM - Function 95

The Telephone Control Unit (TCU) EEPROM has 256 bytes. The programming of the TCU EEPROM specifies the functionality of the telephone part in the faxmachine.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 95, then press "OK".
3. The display shows : TCU EEPROM:RD/RW

Use the cursor left/right keys to switch between read/write and print. To enter one of these options press the cursor keys until the desired option appears in the display, then press OK.

Read/write

After entering this option the display shows: EEPROM A:00 ("A" = address)
 Enter the desired address.
 The display shows: EEPROM A:xx D:xx ("A" = address; "D" = data;
 "xx" = value of address/data)

Now the content of the address can be overwritten by using the dial keypad to enter a new value.
 If the new value is correct the system switches to the next address. To switch to the next address without changing the showed value use the OK key. Press STOP to exit this function.

Print

After entering this function the contents of the whole TCU EEPROM is printed.
 To stop the procedure at any time press the STOP key.

Important TCU EEPROM data:

ADDRESS	DESCRIPTION	VALUE (decimal)
0	Country code	Do not change.
1	Dial mode register 2	bit 6: AGC-STAB (F) bit 7: PSTN side tone (F)
2	Dial mode register 1	bit 0: 0 = pulse 1 = DTMF bit 1: 0 = earth ("R" key) 1 = time break ("R" key) bit 2: 0 = independent 1 = setting of dialmode causes a setting of "R" key function: pulse/earth DTMF/time break bit 3: 0 = normal dialling 1 = extended dialling bit 4/5: 00 = normal pulse dial mode 01 = shifted pulse dial mode 10 = inverse pulse dial mode 11 = not allowed bit 6: 0 = DTMF timed 1 = as long as key pressed bit 7: 0 = MSG mode off (not possible to switch back to pulse dial mode) 1 = MSG mode on (possibility to switch back to pulse dial mode with "R" key)
3	Ringer frequency lowbound	value = 256 - round (1000/frequency)
4	Ringer frequency highbound	value = 256 - round (1000/frequency)
5	Access pause time HIGH	see NOTE below
6	Access pause time LOW	see NOTE below
7	Pulse dial make time	1 ms/unit
8	Pulse dial break time	1 ms/unit
9	DTMF on time	1 ms/unit
10	DTMF off time	1 ms/unit
11	TIME BREAK time (HIGH)	see NOTE below
12	TIME BREAK time (LOW)	see NOTE below
13	EARTH time (HIGH)	see NOTE below
14	EARTH time (LOW)	see NOTE below
15	Pulse dial mode: Pause time between 2 digits (LOW)	see NOTE below
16	Pulse dial mode: Pause time between 2 digits (LOW)	see NOTE below

NOTE: Example for 2-byte timing calculation:

e.g.: 2 seconds -> 2000ms -> 7D0 (HEX)

LOW: low byte of result (= D0); in decimal = 208

HIGH: high byte +1 (= 08); in decimal = 8

3.5.8 TCU Switching - Function 96

This function allows to switch on/off the different analog path combinations.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 96, then press "OK".
3. The display shows : TCU COMMAND: 63

Enter a switch combination number, then press OK;
STOP switches off the analog path. Another number can be entered.

VALUE (HEX)	DESCRIPTION
63	Incoming ring (AC mode)
64	Handset off hook (ACV mode)
65	Listen in (local)
66	Free speaking / onhook dialling
67	Cordless talking
68	Record TAM message
69	Intercom: cordless handset - fax machine
6A	Cordless talking and fax machine listening
6B	Record OGM
6C	TAM message listen on fax machine
6D	not used
6E	TAM message listen on cordless phone
6F	Room monitoring
70	Microphone mute
71	TAM message record and listen on cordless phone
72	Park
73	Parallel telephone check
74	Record TAM message or play OGM, listen on fax machine

3.5.9 Verify Boards - Function 97

This function checks if the CTB and TCU have the same country version.
Use this function after a board replacement.

1. Enter the service mode (see section 3.1.).
2. Press the function key, enter 97, then press "OK".
3. If a failure occurs the display shows "WRONG BOARDS". This message is also printed out.

Reasons for this error message:

- CTB and TCU have different country versions
- no/bad connection between CTB and TCU
- CTB or TCU EEPROM are not programmed correctly
- CTB or TCU is defective

3.5.10 Set TCU Default - Function 98

Use this function to load all the default parameters into the TCU EEPROM which are needed for a specified country.

1. Enter the service mode (see section 3.1).
2. Press the function key, enter 98, then press "OK".
3. The display shows : COUNTRY: 0..F:
Enter the lower bit of the country code (e.g.: for Austria "F") via the dial keypad and the speed dial keys; the default parameters will be stored immediately in the TCU EEPROM.

COUNTRY	COUNTRY CODE (HEXADECIMAL)
AUSTRIA	0F
BELGIUM	0E
DENMARK	0D
FINLAND	0C
FRANCE	0B
GERMANY	0A
GREECE	09
IRELAND	08
ITALY	07
NETHERLANDS	06
NORWAY	05
PORTUGAL	04
SPAIN	03
SWEDEN	02
SWITZERLAND	01
UK	00

3.6 NCU PARAMETER LISTING

The NCU parameters are the 1-byte system parameters that determine the machine's behaviour. They can be modified with function 74.

All values are decimal.

ADDRESS (HEX)	UNIT	RANGE (DEC)	DESCRIPTION
00	100 ms	1-255	If loop current detection is requested and there is no loop current within this time, an error condition occurs.
01	10 ms	10-255	The loop current is accepted if it is stable for this time (extreme low values causing problems with ring detection).
02	10 ms	1-255	Loop current drops within this time are ignored.
03			not used
04	10 ms	4-255	Ringing signal must be at least off for this time to detect end of ring. Set this value higher than pause time of double rings.
05	10 ms	4-255	Ringing signal must be at least on for this time to detect start of ring. Set this value lower than the 1st ring-pulse of double rings.
06	100 ms	5-255	After this time ring count will be cleared. Set this time longer than the maximum pause between 2 rings.
07	2 digit	0-255	The international call sequence can be up to 4 digits long and is packed in 2 bytes, each byte holds 2 digits. Digit "F" indicates the end of the sequence. Example: for the sequence "009" set NCU#07 = 00 (000 dec) and NCU#08 = 9F (159 dec)
08	2 digit	0-255	The international call sequence can be up to 4 digits long and is packed in 2 bytes, each byte holds 2 digits. Digit "F" indicates the end of the sequence. Example: for the sequence "009" set NCU#07 = 00 (000 dec) and NCU#08 = 9F (159 dec)
09	2 digit	0-255	The domestic call sequence can be up to 4 digits long and is packed in 2 bytes, each byte holds 2 digits. Digit "F" indicates the end of the sequence. Example: for the sequence "0" set NCU#09 = 0F (015 dec) and NCU#0A = FF (255 dec)
0A	2 digit	0-255	The domestic call sequence can be up to 4 digits long and is packed in 2 bytes, each byte holds 2 digits. Digit "F" indicates the end of the sequence. Example: for the sequence "0" set NCU#09 = 0F (015 dec) and NCU#0A = FF (255 dec)
0B	#	0-4	Keyboard; 0 = standard Europe, 1 = Sweden, 2 = France, 3 = USA, 4 = Philips
0C	1 s	1-255	Max. wait time for dialtone. If no dialtone is detected within this time, dialling is aborted, NO DIALTONE message is displayed (min 2 cycles in case of tone cadences).
0D	20 ms	0-255	PAUSE-key time. The delay in dialling generated by the REDIAL/PAUSE key (255 ... wait for international dialtone!).
0E	1 s	0-255	Total delay time allowed for PAUSE-key entries (0 = unlimited).

ADDRESS (HEX)	UNIT	RANGE (DEC)	DESCRIPTION
0F	100 ms	2-255	If PABX dialtone detection is disabled(BSW 0 Bit 1), the machine waits this time instead of dialtone detection. NOTE: An delay of NCU parameter 01 plus 0.65s is added to this value!
10	100 ms	0-255	If PSTN dialtone detection is disabled (BSW 0 Bit 0), the machine waits this time instead of dialtone detection.
11	#	0-255	Maximum number of dialling attempts to a fax number including the initial dial.
12	10 s	1-255	Pause time between 2 automatic redial attempts (valid for FAX send and TAM forwarding mode, too).
13	#	1-255	Training repeat count after FTT.
14	1 s	0-255	This additional time is added to the standart of 35s wait time for a connect. During a fax call the machine waits the resulting time (35s + NCU#14) for a valid response (CED) before disconnecting.
15			not used
16	1 ms	0-255	Delay between CFR and message phase.
17	-1 dBm	35-51	Input sensitivity level.
18			not used
19			not used
1A			not used
1B	-dBm	0-15	Modem transmit signal output level (default is country dependent).
1C	#		Reflects function 16 (setting of current language for display and reports). The actual value is an index to the n-th language within the ROM-set and not a unique number.
1D	#		Available AVM languages (do not change).
1E	#		Available AVM languages (do not change).
1F	1 s	1-255	Maximum length of OGM1 message.
20	1 s	<NCU#1F	After this time has passed during OGM1-recording, the "record-LED" starts blinking.
21	1 s	1-255	Maximum length of OGM2 message.
22	1 s	<NCU#21	After this time has passed during OGM2-recording, the "record-LED" starts blinking.
23	1 s	8-15	Specifies the pause time for TEL/FAX and TAM/FAX mode between two AVM messages.
24			not used
25	1 s	<NCU#1F	The minimum time for OGM1, if set to 0 no minimum time is required for a valid OGM1.
26	100 ms	0-255	Pause between going online and playing OGM1 or voice prompt.
27	1 s	0-255	Silence is detected if the line signal is below the silence detection level (NCU#32) for this duration, value reflects function 34 setting.

ADDRESS (HEX)	UNIT	RANGE (DEC)	DESCRIPTION																											
28	bits		Selectable number of rings (0...7) for TAM/FAX mode. Bitmask; each bit stands for a valid selection in the range from 0 to 7 rings <table><tr><td>number of rings</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>bitnumber</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>decimal eq.</td><td>128</td><td>64</td><td>32</td><td>16</td><td>8</td><td>4</td><td>2</td><td>1</td></tr></table> Example: User should be able to select 3, 4 and 5 rings only: add 8, 16, 32 for the decimal equivalence of the according ringnumbers = 056 to set.	number of rings	7	6	5	4	3	2	1	0	bitnumber	7	6	5	4	3	2	1	0	decimal eq.	128	64	32	16	8	4	2	1
number of rings	7	6	5	4	3	2	1	0																						
bitnumber	7	6	5	4	3	2	1	0																						
decimal eq.	128	64	32	16	8	4	2	1																						
29	bits		Selectable number of rings (8...15) for TAM/FAX mode. Bitmask; each bit stands for a valid selection in the range from 8 to 15 rings <table><tr><td>number of rings</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td></tr><tr><td>bitnumber</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>decimal eq.</td><td>128</td><td>64</td><td>32</td><td>16</td><td>8</td><td>4</td><td>2</td><td>1</td></tr></table> Example: User should be able to select 8, 9 and 10 rings only: add 1, 2, 4 for the decimal equivalence of the according ringnumbers = 007 to set.	number of rings	15	14	13	12	11	10	9	8	bitnumber	7	6	5	4	3	2	1	0	decimal eq.	128	64	32	16	8	4	2	1
number of rings	15	14	13	12	11	10	9	8																						
bitnumber	7	6	5	4	3	2	1	0																						
decimal eq.	128	64	32	16	8	4	2	1																						
2A	#	1-15	TAM mode default ringcount, reflects function 33 setting.																											
2B	10 ms		Delay between DCS and training.																											
2C	bits		Selectable RECORD TIME (function 41) <table><tr><td>possible lenght</td><td>120s</td><td>60s</td><td>30s</td><td>AUTO</td></tr><tr><td>bitnumber</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>decimal eq.</td><td>8</td><td>4</td><td>2</td><td>1</td></tr></table> Example: User should be able to select 30s and 120s only: add 2 and 8 for the decimal equivalence of the according times = 010 to set	possible lenght	120s	60s	30s	AUTO	bitnumber	3	2	1	0	decimal eq.	8	4	2	1												
possible lenght	120s	60s	30s	AUTO																										
bitnumber	3	2	1	0																										
decimal eq.	8	4	2	1																										
2D	1 s	1-255	Reflects the record time value selected with function 41; when this value is changed in service mode, it will be overwritten by function 41.																											
2E			DTMF code for remote control of the faxswitch. Reflects settings of function 35 (EXT. PHONE) 8 bits for two DTMF characters. First character is reserved with "A" (HEX) (= DTMF code "*"). Example: DTMF code * 2 should be entered Bitfield: 1010 0010 in decimal = 162 to set																											
2F			not used																											
30			not used																											
31			not used																											
32	units (not dBm!)	30-255	Energy level for the TAM/FAX mode which is not allowed to be exceeded to detect silence.																											
33			Indicates the source of energy detection which should be used for silence detection. This parameter is splitted into internal (TAM-modem path) and external (EXT. PHONE-CNG path) silence index. The 4 lowest bits are used for the internal and the 4 highest bits for the external silence.																											

ADDRESS (HEX)	UNIT	RANGE (DEC)	DESCRIPTION																		
34	#	0-3	Index to the CNG table. This table has 4 options with different tolerance for the CNG frequency. 0: 1100 Hz $\pm$ 26 Hz 1: 1100 Hz $\pm$ 40 Hz 2: 1100 Hz $\pm$ 50 Hz 3: 1100 Hz $\pm$ 100 Hz																		
35	20 ms	0-255	Minimum length of busy tone.																		
36	1 s	10-255	After this time has passed in TAM remote operation the TAM sends a lo beeps which means that the user has to prolong the remote TAM operation by pressing any DTMF key.																		
37	1 ms	0-255	Delay between detection of ring and sending the CED (T30 protocol).																		
38	#	0-255	Only when BSW03 bit4 is switched off: Sensitivity of CNG detection. Valid for INT.DEVICE and 15Mhz clock speed. Value 0 ... about -49dBm.																		
39	#	0-255	Only when BSW03 bit4 is switched off: Sensitivity of CNG detection. Valid for EXT.DEVICE and 15Mhz clock speed. Value 0 ... about -49dBm.																		
3A	#	0-255	Only when BSW03 bit4 is switched off: Sensitivity of CNG detection. Valid for INT.DEVICE and 20Mhz clock speed. Value 0 ... about -49dBm.																		
3B	#	0-255	Only when BSW03 bit4 is switched off: Sensitivity of CNG detection. Valid for EXT.DEVICE and 20Mhz clock speed. Value 0 ... about -49dBm.																		
3C	bits		Contains all selectable rings in TEL/FAX mode in the form of a bitfield. Each bit represents a selectable ring. Examples: <table><tr><th>value (dec)</th><th>bitfield</th><th>selectable rings</th></tr><tr><td>000</td><td>00000000</td><td>no rings selectable</td></tr><tr><td>001</td><td>00000001</td><td>0</td></tr><tr><td>002</td><td>00000010</td><td>1</td></tr><tr><td>015</td><td>00001111</td><td>0,1,2,3</td></tr><tr><td>031</td><td>00011111</td><td>0,1,2,3,4</td></tr></table> Example: If the user should be able to select 0,1,2,3 rings only set NCU #3C : 015. NOTES: - 000 disables the user to select this function. - The time between 2 rings is country dependent (3 - 5 s). - Too high values may cause problems with silence fax machines.	value (dec)	bitfield	selectable rings	000	00000000	no rings selectable	001	00000001	0	002	00000010	1	015	00001111	0,1,2,3	031	00011111	0,1,2,3,4
value (dec)	bitfield	selectable rings																			
000	00000000	no rings selectable																			
001	00000001	0																			
002	00000010	1																			
015	00001111	0,1,2,3																			
031	00011111	0,1,2,3,4																			
3D	#	0-255	Number of rings in TEL/FAX mode.																		
3E	#	0-255	Number of rings in EXT TEL mode.																		
3F	1 s	0-255	Silence detection time in EXT TEL mode (reflects function 35 setting).																		
40	#	0-255	Modem correction factor (LIU dependent).																		
41	10 ms	0-255	Ringer on-time for the duplex ringer (0 = disabled).																		
42	#	0-255	Default value for the OGM output level.																		
43	#	0-255	not used																		
44	#	0-255	not used																		
45			not used																		

ADDRESS (HEX)	UNIT	RANGE (DEC)	DESCRIPTION																											
46	units (not dBm)	0-255	Energy level for the EXT PHONE mode which is not allowed to be exceeded to detect silence. The actual value can be monitored with BSW09 bit1.																											
47	units (not dBm)	0-255	This value is added to the OGM output level (NCU #42) during AVM playback to allow different output levels for AVM's and OGM.																											
48	#	0-255	Mercury mode																											
49	bits		Selectable number of rings (0...7) for the EXT.PHONE mode. Bitmask; each bit stands for a valid selection in the range from 0 to 7 rings <table><tr><td>number of rings</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>bitnumber</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>decimal eq.</td><td>128</td><td>64</td><td>32</td><td>16</td><td>8</td><td>4</td><td>2</td><td>1</td></tr></table> Example: User should be able to select 3, 4 and 5 rings only: add 8, 16, 32 for the decimal equivalence of the according ringnumbers = 056 to set.	number of rings	7	6	5	4	3	2	1	0	bitnumber	7	6	5	4	3	2	1	0	decimal eq.	128	64	32	16	8	4	2	1
number of rings	7	6	5	4	3	2	1	0																						
bitnumber	7	6	5	4	3	2	1	0																						
decimal eq.	128	64	32	16	8	4	2	1																						
4A	bits		Selectable number of rings (8...15) for the EXT.PHONE mode. Bitmask; each bit stands for a valid selection in the range from 8 to 15 rings <table><tr><td>number of rings</td><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td></tr><tr><td>bitnumber</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr><tr><td>decimal eq.</td><td>128</td><td>64</td><td>32</td><td>16</td><td>8</td><td>4</td><td>2</td><td>1</td></tr></table> Example: User should be able to select 8, 9 and 10 rings only: add 1, 2, 4 for the decimal equivalence of the according ringnumbers = 007 to set.	number of rings	15	14	13	12	11	10	9	8	bitnumber	7	6	5	4	3	2	1	0	decimal eq.	128	64	32	16	8	4	2	1
number of rings	15	14	13	12	11	10	9	8																						
bitnumber	7	6	5	4	3	2	1	0																						
decimal eq.	128	64	32	16	8	4	2	1																						
4B	#	0-255	After this time has passed, the machine interrupts a cordless intercom connection.																											
4C	#	0-255	This number added to 200 gives the unit price per tax pulse.																											
4D	20 ms	0-255	This value defines the width of a valid CNG - on signal.																											
4E	20 ms	0-255	This value defines the width of a valid CNG - pause.																											

3.7 BITSWITCH LISTING

The bitswitches are the 1-bit system parameters that determine the machine's behaviour. They can be modified with function 73.

BSW00

BIT-NR	SETTINGS	DESCRIPTION
0	1 = off 0 = on	PSTN dial tone detection.
1	1 = off 0 = on	PABX dial tone detection.
2	1 = off 0 = on	Busy tone detection.
3	1 = off 0 = on	Loop current detection.
4	1 = on 0 = off	Country dial tone detection (see NCU parameter 09 and 0A).
5	1 = on 0 = off	International dial tone detection (see NCU parameter 07 and 08).
6	1 = on 0 = off	S: dial tone detection, detection of dialtone after the country code.
7	1 = on 0 = off	CH: redial only when busy.

BSW01

BIT-NR	SETTINGS	DESCRIPTION
0	1 = on 0 = off	SPEAKER ON during T30 handshake.
1	1 = on 0 = off	SPEAKER ON during T30 handshake and V29 operation.
2	1 = on 0 = off	DISPLAY of PARAMETERS instead of CSI Format: SSRC SS(speed): 96, 72, 48, 24 R(resolution): N(normal), F(fine) C(coding): H(huffman), R(read)
3		Bit3 Bit4 maximum document length 0 x 0,6 m 1 1 0,8 m 1 0 8 minute transmission limit
5	1 = 1s 0 = 0s	BSW 01/5 BSW 09/4 delay before sending CNG 0 0 3s 0 1 0s 1 1 1s
6		not used
7	1 = on 0 = off	Fax error (LED+message) autoreset after next good fax transaction.

BSW02

BIT-NR	SETTINGS	DESCRIPTION
0	1 = off 0 = on	Footer printed on received page: date/time, CSI, page number.
1	1 = off 0 = on	CSI programming by user (function 12 for the user).
2	1 = off 0 = on	DIALMODE / PABX setting possible for user (function 14 for the user).
3	1 = off 0 = on	Disables selection of AUTOSTART (function 26) for the user.
4	1 = off 0 = on	Print out transmission report automatically.
5	1 = off 0 = on	TTI generation on transmitted page (page header).
6	1 = yes 0 = no	TTI replaces graphic data (in/out position of page header).
7	1 = off 0 = on	Key press acknowledge tone generated (reflects function 54 setting).

BSW03

BIT-NR	SETTINGS	DESCRIPTION
0		Bit0 Bit1 Format date display 0 x Day Month Year 1 1 Month Day Year 1 0 Year Month Day
1		
2	1=12h 0=24h	Clock format
3	1 = off 0 = on	Disables ON HOOK LISTEN IN function for the user.
4	1 = on 0 = off	D: special FTZ requirements (18TR53)
5	1 = on 0 = off	D: optional user interface configuration
6	1 = on 0 = off	D: cost counter
7	1 = on 0 = off	D: invert loop current detection

BSW04

BIT-NR	SETTINGS	DESCRIPTION
0		Bit0 Bit1 Cable length (adjust if problems with sending/receiving) 0 0 no 0 1 short (1,8 km) 1 0 medium (3,6 km) 1 1 long (7,2 km)
1		
2	1 = on 0 = off	Echo cancelling
3	1 = off 0 = on	Disables selection of EXTERNAL PHONE for the user (= function 35 for the user).
4	1 = digits 0 = characters	Display format of month
5	1 = off 0 = on	User may change the language (function 16 for the user).
6		not used
7		not used

BSW05

BIT-NR	SETTINGS	DESCRIPTION
0	1 = on 0 = off	Automatic FALL BACK to 9600 bps after a succeeding transmission if slow transmission was set before.
1	1 = off 0 = on	Disables selection of USAGE CODE for the user (= function 19 for the user).
2		not used
3		not used
4	1 = on 0 = off	TAM remote control TIMEOUT after 50s of remote user DTMF inactivity (the time can be adjusted with NCU#36).
5	1 = off 0 = on	RDS TIMEOUT - RDS access is switched off after 24 hours.
6	1 = on 0 = off	Automatic TRANSMISSION ERROR TIMEOUT of 30s.
7	1 = off 0 = on	Disables selection of DTMF code in function 35.

BSW06

BIT-NR	SETTINGS	DESCRIPTION
0	1 = off 0 = on	Online RECORDING of PHONECALLS.
1	1 = on 0 = off	Enable user to select RINGBACK.
2		not used
3	1 = on 0 = off	TAM DIALTONE DETECTION (stops recording when detected).
4	1 = off 0 = on	CALL MONITORING during TAM RECORD.
5	1=425Hz 0=700Hz	RINGBACK tone
6	1 = 3s 0 = 5s	RINGBACK cadence
7	1 = on 0 = off	150 Hz dialtone detection

BSW07

BIT-NR	SETTINGS	DESCRIPTION
0	1 = off 0 = on	BUSY detection BEFORE DIAL (to avoid misdetection of PABX-dialtone).
1	1 = off 0 = on	SILENCE detection from EXT.PHONE.
2	1 = on 0 = off	"TIME STAMP: ON", shows date and time of call during TAM message playback (reflects function 42 setting).
3		not used
4	1 = on 0 = off	FAX AUTOSTART - machine detects for CED tone during manual dialling (reflects function 26 setting).
5	1 = off 0 = on	Disables selection of REMOTE DIAGNOSTIC (function 55 for the user).
6	1 = off 0 = on	Redial attempts in FORWARDING mode.
7		not used

BSW08

BIT-NR	SETTINGS	DESCRIPTION
0	1 = on 0 = off	OGM1 DELAY if a single CNG is detected before OGM1.
1	1 = off 0 = on	R key muting in PSTN mode, execute Earth/Time Break instead.
2	1 = off 0 = on	Sending of NSF (NOTE: RDS doesn't work if switched off !)
3	1 = off 0 = on	POLLING SEND WITHOUT PAPER.
4	1 = on 0 = off	F: after last unsuccessful redial disable start access to a stored number (French approbation requirement).
5	1 = on 0 = off	F: BEEP BEFORE OGM2 (french approbation requirement).
6	1 = off 0 = on	Disables selection of SILENCE detection time (function 34 for the user).
7	1 = on 0 = off	Periodic printing of FAX JOURNAL.

BSW09

BIT-NR	SETTINGS	DESCRIPTION
0	1 = on 0 = off	F: external TAM mode; take line immediately after external TAM drops line (French approbation requirement).
1	1 = on 0 = off	Display SILENCE VALUES (threshold for NCU#32) during external phone mode. This bitswitch is only for debugging.
2	1 = off 0 = on	Disables total call locking in function 19.
3	1 = on 0 = off	Possibility to switch the TAM on via remote-control.
4	1 = on 0 = off	BSW 01/5 BSW 09/4 delay before sending CNG 0 0 3s 0 1 0s 1 1 1s
5		not used
6		not used
7		not used

BSW0A

BIT-NR	SETTINGS	DESCRIPTION
0	1 = on 0 = off	Loop current detection during cordless call as defined by BSW00 bit 3.
1	1 = on 0 = off	Dial tone detection during cordless call as defined by BSW00 bit 1.
2	1 = on 0 = off	Busy tone detection during cordless call as defined by BSW00 bit 2.
3	1 = on 0 = off	Online handsfree speaking and monitoring a cordless call on fax machine.
4	1 = on 0 = off	Lifting the handset on the fax machine takes over a cordless call.
5	1 = on 0 = off	Playing new TAM messages on cordless local intercom.
6	1 = on 0 = off	At cordless local intercom a special "intercom ring" is generated; the user has to press "TRANSFER/INTERCOM" before speaking (reflects function 57 setting).
7	1 = on 0 = off	F: Terminating impedance at PABX (= 600 Ω)

BSW0B

BIT-NR	SETTINGS	DESCRIPTION
0	1 = on 0 = off	VOICE PROMPT in TEL/FAX mode.
1	1 = on 0 = off	VOICE PROMPT in TAM/FAX mode.
2	1 = on 0 = off	VOICE PROMPT in EXT-TEL mode.
3		not used
4		not used
5		not used
6	1 = on 0 = off	Direct fax reception on a normal ringing signal.
7	1 = on 0 = off	Direct fax reception on a duplex ringing signal (e.g. Hong Kong).

BSW0C

BIT-NR	SETTINGS	DESCRIPTION
0	1 = off 0 = on	DTMF detection.
1		not used
2		not used
3	1 = off 0 = on	Display "DELETE OLD MSG" in memo and forward mode.
4	1 = off 0 = on	DTMF detection during OGM.
5	1 = off 0 = on	Acknowledge beep for each detected DTMF tone.
6		not used
7	1 = on 0 = off	Additional " * " for access and CBT code.

BSW0D

BIT-NR	SETTINGS	DESCRIPTION
0		not used
1		not used
2	1 = on 0 = off	Possibility to set EXT.PHONE mode (function 35).
3	1 = on 0 = off	Authorized reception (reflects function 21 setting).
4	1 = on 0 = off	Slow transmission (reflects function 22 setting).
5	1 = off 0 = on	PSTN dialtone detection during PABX mode. Set this bit to support PABX systems with no PSTN dialtone.
6	1=PABX 0=PSTN	Reflects function 14 settings.
7	1 = on 0 = off	Don't ring at fax reception in TAM mode. DO NOT CHANGE!

BSW0E

BIT-NR	SETTINGS	DESCRIPTION
0	1 = on 0 = off	1: If EXT.PHONE is used, parallel phones are allowed.
1	1=Tx 0=9600bps	Rx speed control. 1: Rx speed = Tx speed 0: Rx speed = 9600 bps
2	1 = on 0 = off	If set and slow (4800 bps) is switched on, speed is 2400 bps instead of 4800 bps.
3	1 = off 0 = on	Cordless intercom.
4	1 = on 0 = off	Possibility to enter a remote fax start code like: **, ##, *, #.
5	1 = off 0 = on	Increases the length of reports (e.g.: transmission report).
6		not used
7		not used

NOTE 1: To get the default settings of Bitswitches and NCU parameters, use function 71 (print system report). The default values and the actual values are listed with a " * " indicating modifications.

NOTE 2: If user forgets his usage code, enter BE8E.

NOTE 3: If user forgets his TAM ACCESS CODE enter service mode and the old code is not asked for.

4. REMOVALS

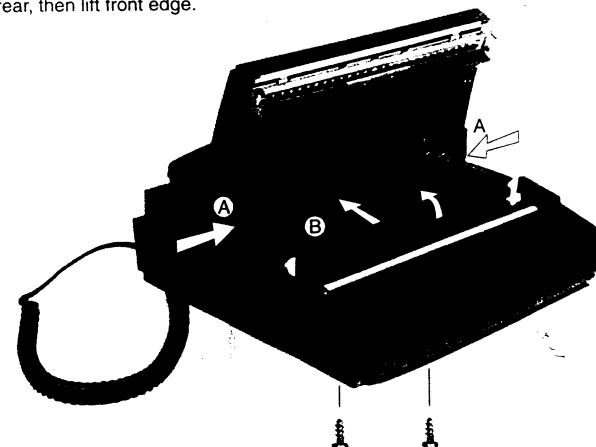
CAUTION

Unplug the machine from the power outlet before removing any cover.
Do not open the external power supply unit!

4.1 Remove paper holder and ROM's

4.1.1 Paper holder

1. Remove 2 screws from the bottom cover.
2. Open the printer cover, press flaps [A] inwards to release.
3. Push paper holder [B] to the rear, then lift front edge.



4.1.2 Change ROM's

1. Remove paper holder.
2. Remove ROM's using the PLCC remover.

REASSEMBLE INSTRUCTION:

ROM position A: ROM marked 1

ROM position B: ROM marked 0



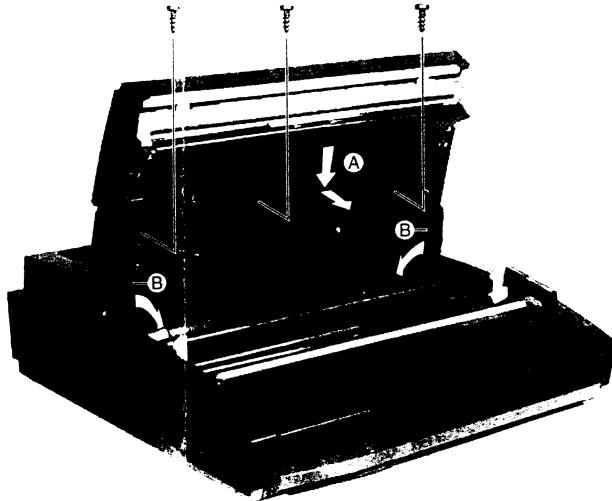
WARNING

Be careful when inserting the ROM's. Check position and orientation of the ROM's.
Shortcircuits may damage the FCU board!

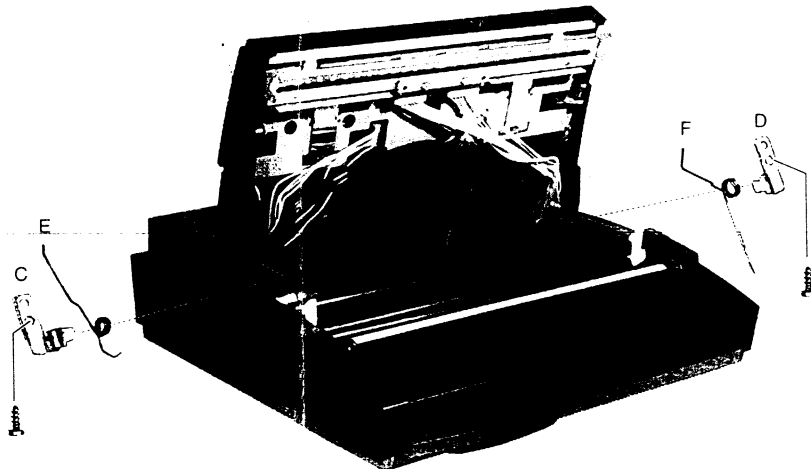
4.2 Printer cover

4.2.1 Remove printer cover

1. Open the printer cover
2. Remove the paper guide [A] by pushing it downwards, lifting the lower edge and pulling the brackets [B] out of the fixing holes (3 screws).

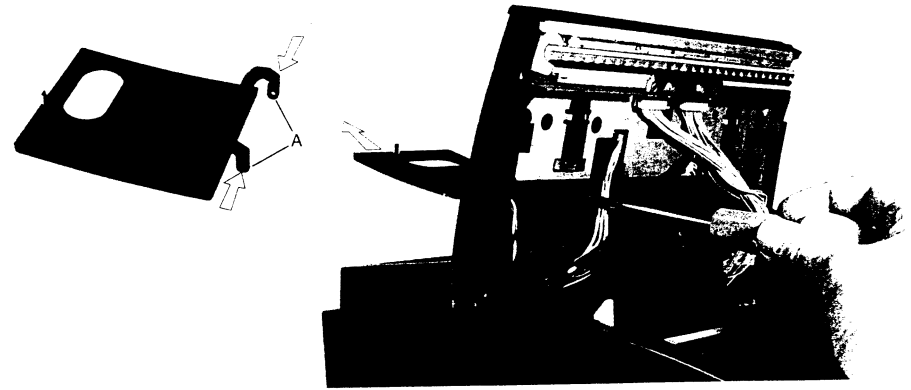


3. Remove two bearing brackets [C, D] with holding springs [E, F], and remove printer cover. (2 screws, 5 connectors, 2 ground cables)



4.2.2 TAM key cover

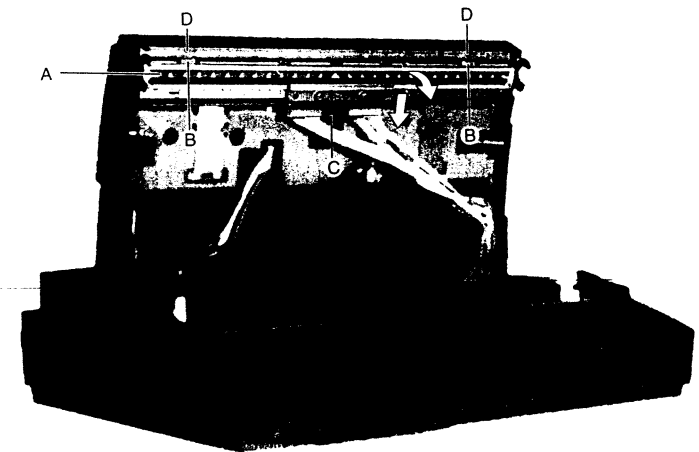
1. Open the printer cover and remove the paper guide (see section 4.2.1).
2. Bend the hinges [A] of the TAM key cover inwards as shown in the detail drawing by using a small screwdriver.



4.2.3 Thermal printhead (TPH)

1. Open the printer cover and remove the paper guide (see section 4.2.1).
2. Push thermal printhead [A] downwards until dents [B] slide out of the location holes. Take out TPH by pushing upwards (2 connectors).

NOTE: Do not remove the plugboard which is mounted with 2 screws on the TPH!



REASSEMBLE INSTRUCTION:

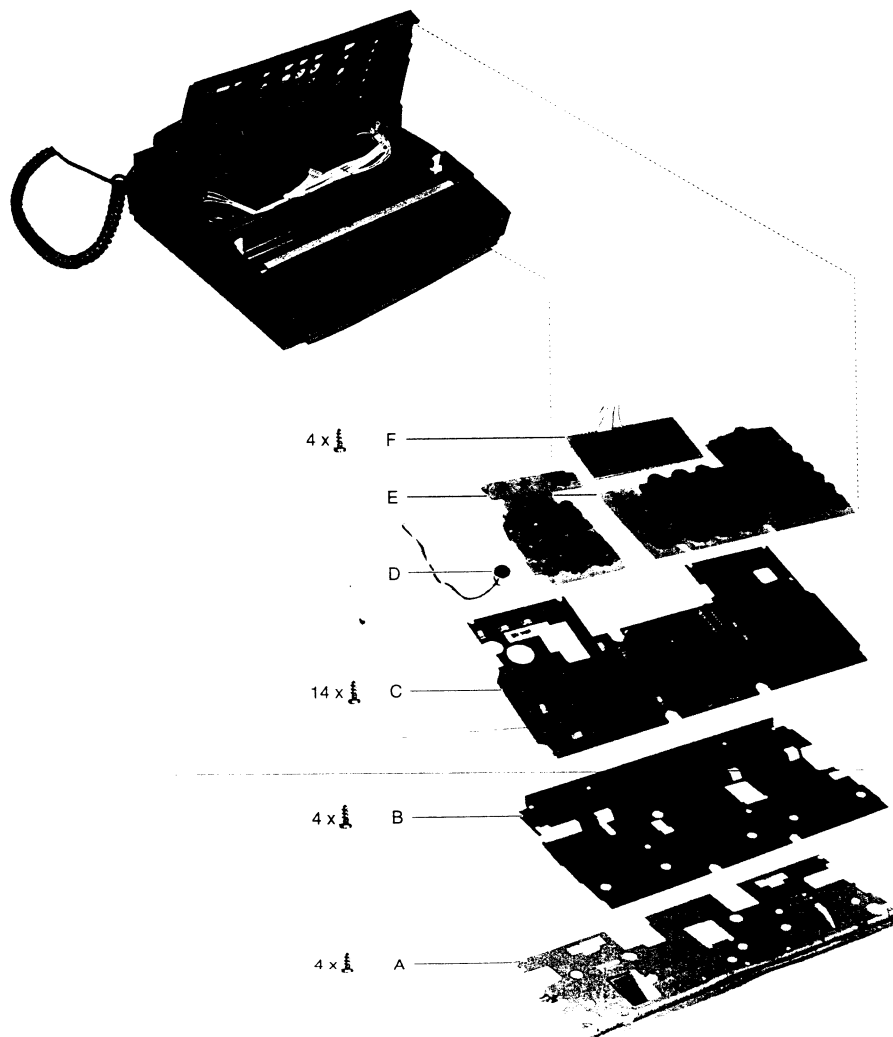
First insert TPH into location hole [C] then push against the pressure springs and insert dents [B] into location holes [D]

CLEANING INSTRUCTION:

Clean the thermal printhead with a soft cloth and alcohol.

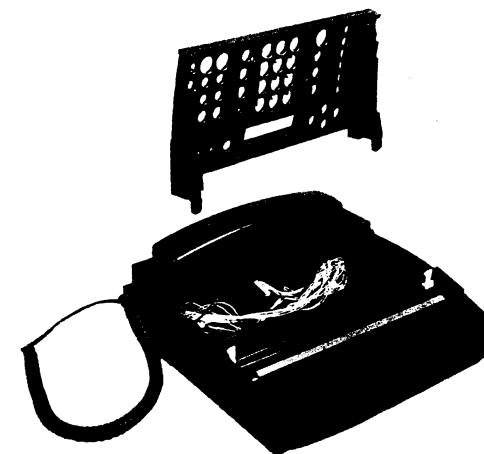
4.2.4 Operation panel unit (OPU), rubber mat, microphone and LCD module

1. Remove the thermal printhead (see section 4.2.3), disconnect 3 connectors.
2. Remove printer carrier plate [A] (4 screws, 2 ground cables).
3. Remove isolation plate [B] (4 screws).
4. Remove OPU [C] (14 screws, 1 connector).
5. Remove microphone [D] by pulling it out of the rubber mat (1 connector on TCU).
6. Remove rubber mat [E].
7. Remove LCD module [F] (4 screws, 1 connector)



4.2.5 Operation panel cover

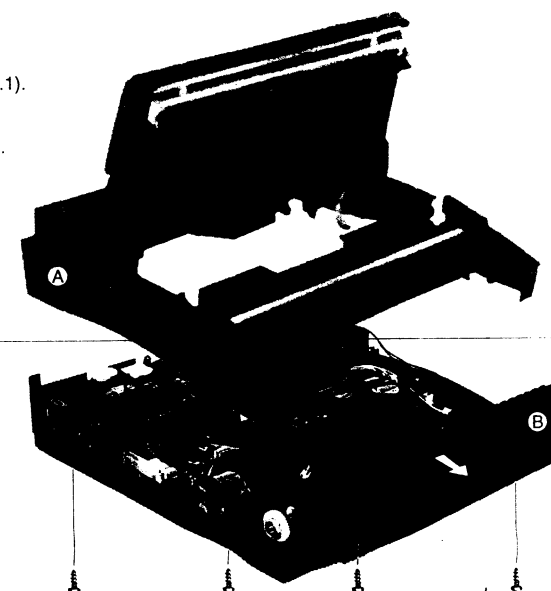
1. Remove printer cover (see section 4.2.1).
2. Remove thermal printhead (see section 4.2.3)
3. Remove key flap (see section 4.2.2).
4. Remove OPU, rubber mat, microphone and LCD module (see section 4.2.4).



4.3 Bottom cover

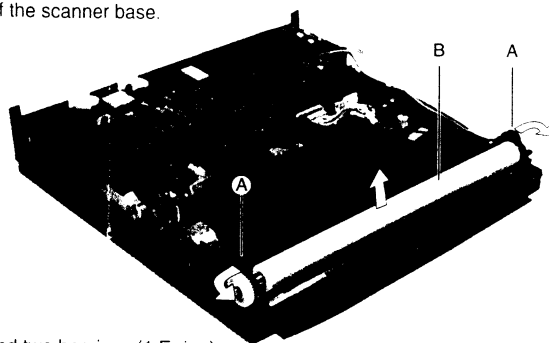
4.3.1 Remove bottom cover

1. Remove 4 screws from the bottom.
2. Remove paper holder (see section 4.1.1).
3. Disconnect cables from FCU, TCU.
4. Lift top cover [A] (see also section 4.4).
5. Open and remove scanner cover [B].



4.3.2 Scanner roller

1. Remove bottom cover (see section 4.3.1).
2. Bend the bearing levers [A] outwards then to the front.
3. Lift the scanner roller [B] out of the scanner base.

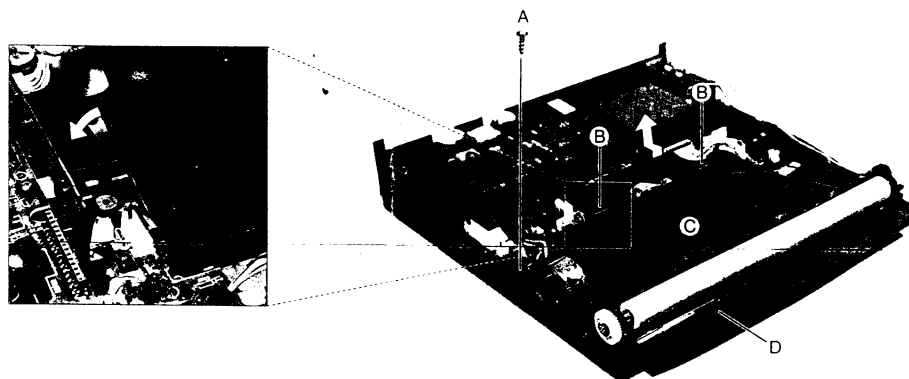


4. Remove gear, scanner roller and two bearings (1 E ring).
- CLEANING INSTRUCTION: Clean the scanner roller with a soft cloth and alcohol.



4.3.3 Scanner unit

1. Remove bottom cover (see section 4.3.1).
2. Remove 1 screw [A].
3. Use a screwdriver to release clips [B].
4. Lift scanner unit [C] out of the bottom cover.

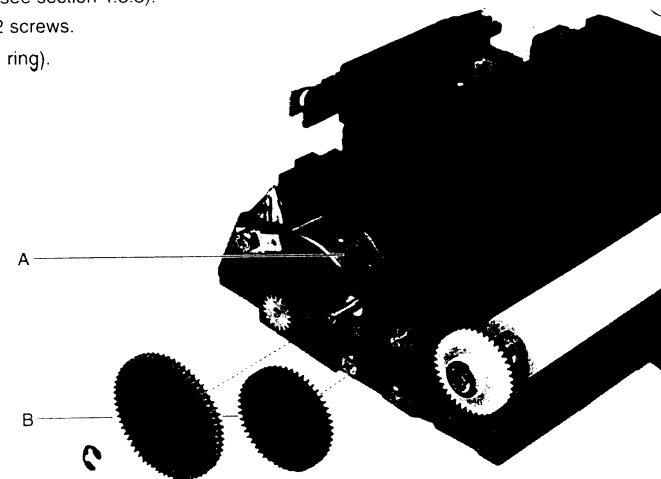


WARNING

Be careful when removing the scanner unit. Take care of sensor lever [D] and sensor spring!!

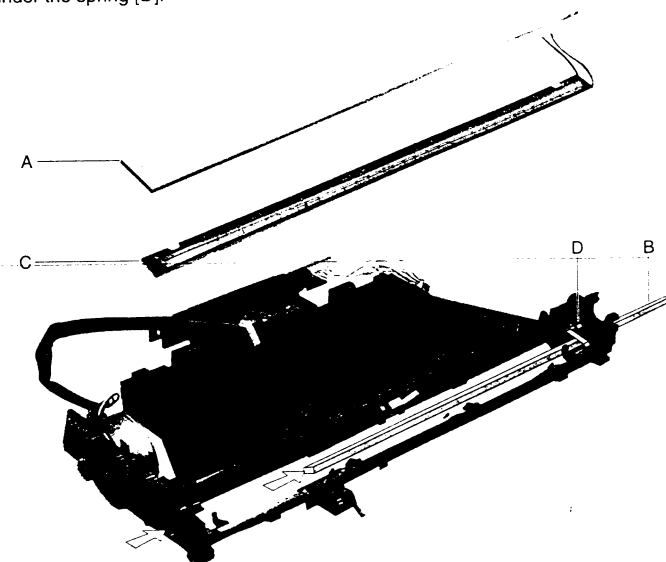
4.3.4 Tx motor, Tx gears

1. Remove scanner unit (see section 4.3.3).
2. Remove Tx motor [A] 2 screws.
3. Remove gears [B] (1 E ring).

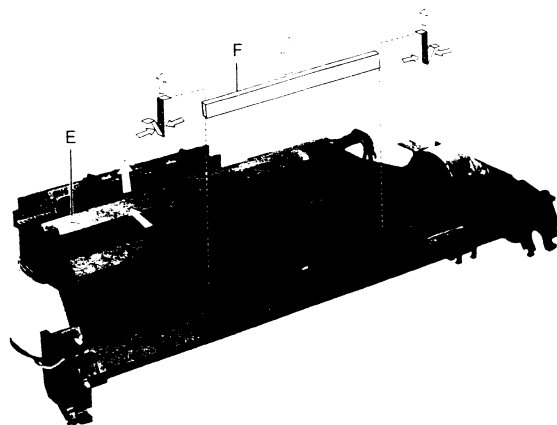


4.3.5 Glass plate, LED array and mirrors

1. Remove scanner unit (see section 4.3.3).
2. Remove scanner roller (see section 4.3.2).
3. Remove glass plate [A].
4. Remove long mirror [B] by pressing from the left side.
5. Pull out LED array [C] from under the spring [D].



6. Turn around the scanner unit; remove medium mirror [E] and short mirror [F] by pushing them as shown.



REASSEMBLE INSTRUCTION:

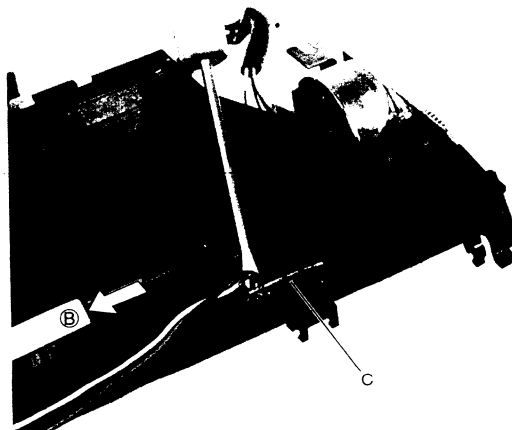
Be sure that the coated side of the mirrors is on the correct side! The springs must be under the glass plate!

CLEANING INSTRUCTION:

Clean the coated surface of the mirrors and the glass plate with soft cloth and window cleaner.

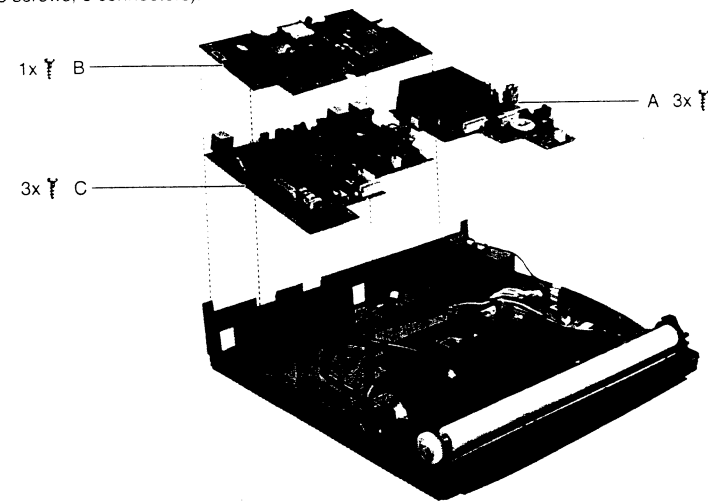
4.3.6 Document in sensor (SDI)

1. Remove scanner unit (see section 4.3.3).
2. Remove sensor actuator and spring [A].
3. Remove long mirror [B] by pressing from the side.
4. Remove SDI [C] by using a small screwdriver.



4.3.7 Power control unit (PCU), Line access board (LAB), Telephone control unit (TCU)

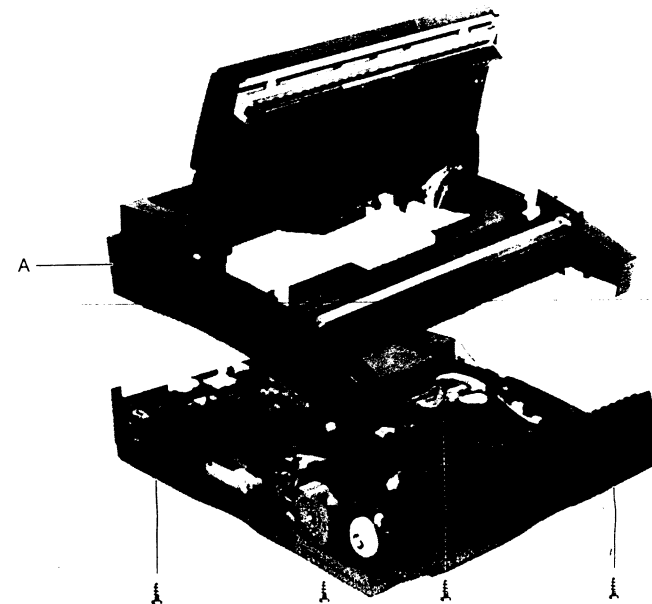
1. Remove bottom cover (see section 4.1.1).
2. Remove PCU [A] (3 screws, 4 connectors).
3. Remove LAB [B] by pushing it gently upwards (1 screw).
4. Remove TCU [C] (3 screws, 6 connectors).



4.4 Top cover

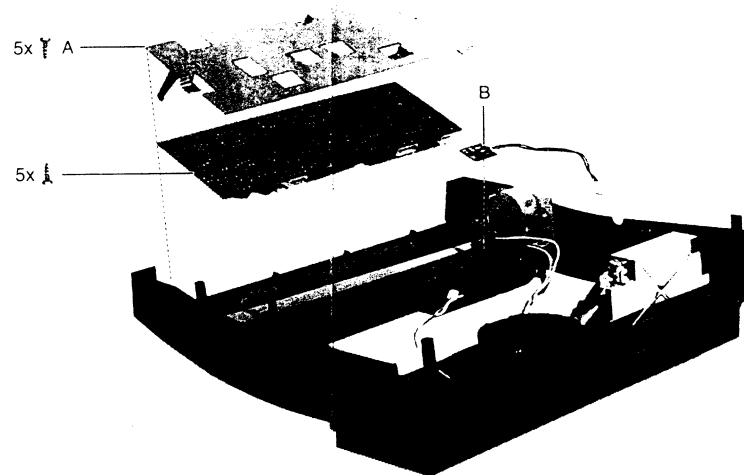
4.4.1 Remove top cover

see section 4.3.1.



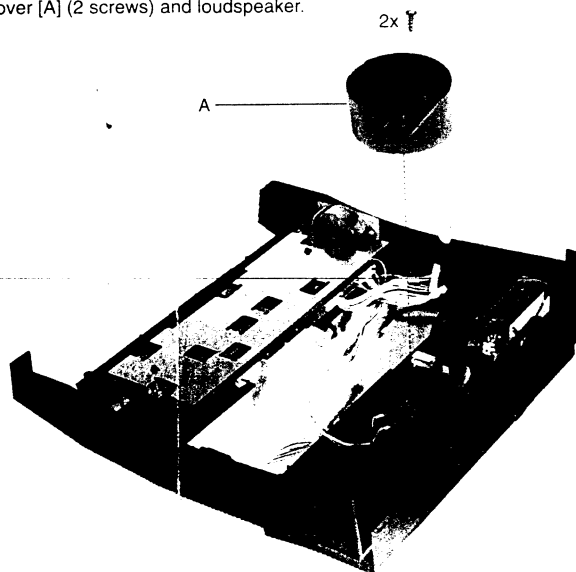
4.4.2 FCU, Paper out sensor (SOP)

1. Remove top cover (see section 4.3.1).
2. Remove FCU (with shielding plate) [A] (5 screws) disconnect cables.
3. Remove FCU from shielding plate (5 screws).
4. Remove SOP [B].



4.4.3 Loudspeaker

1. Remove top cover (see section 4.3.1).
2. Remove loudspeaker cover [A] (2 screws) and loudspeaker.

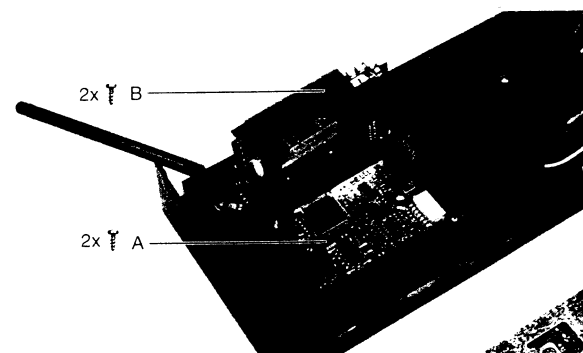


4-10

4.4.4 Cordless telephone board, RF module, antenna

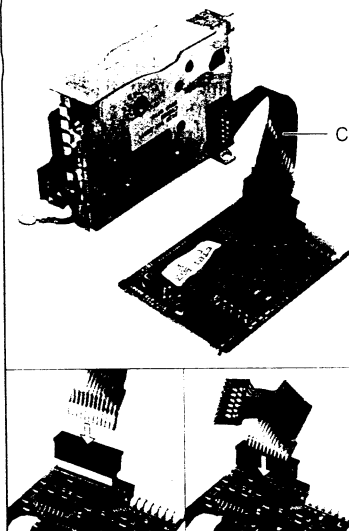
1. Remove top cover (see section 4.3.1).
2. Remove CTB [A] (2 screws, 3 cables).
3. Remove RF module [B] (2 screws) and remove antenna.

NOTE: Be careful by reconnecting the foil cable [C], see picture.



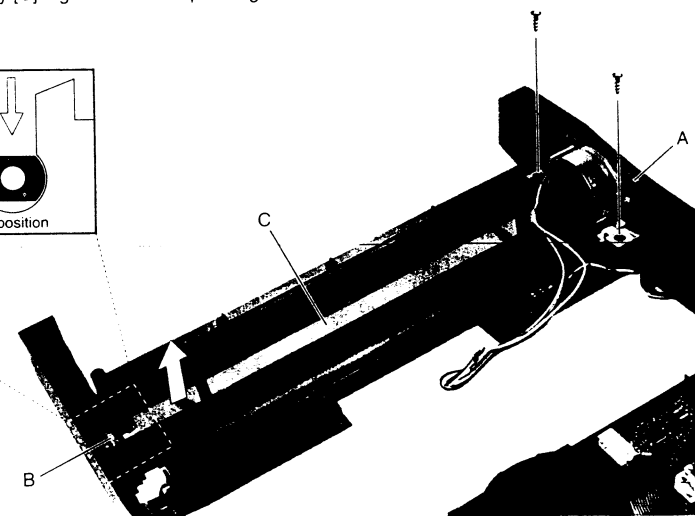
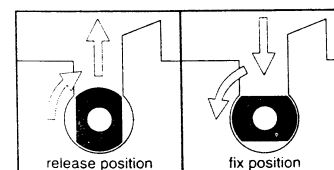
REASSEMBLE INSTRUCTION:

RF module - CTB



4.4.5 Printer roller unit

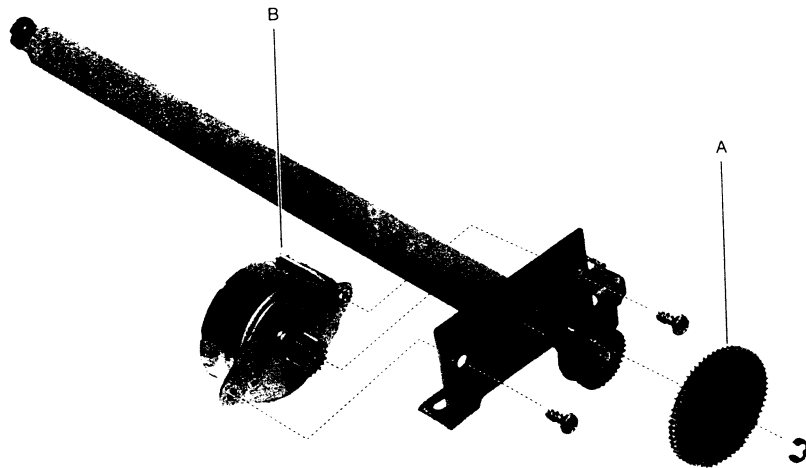
1. Remove FCU (see section 4.4.2)
2. Remove printer gear bracket [A] (2 screws).
3. Turn bearing [B] into release position (see detail drawing).
4. Remove printer roller assy [C] together with the printer gear bracket.



4-11

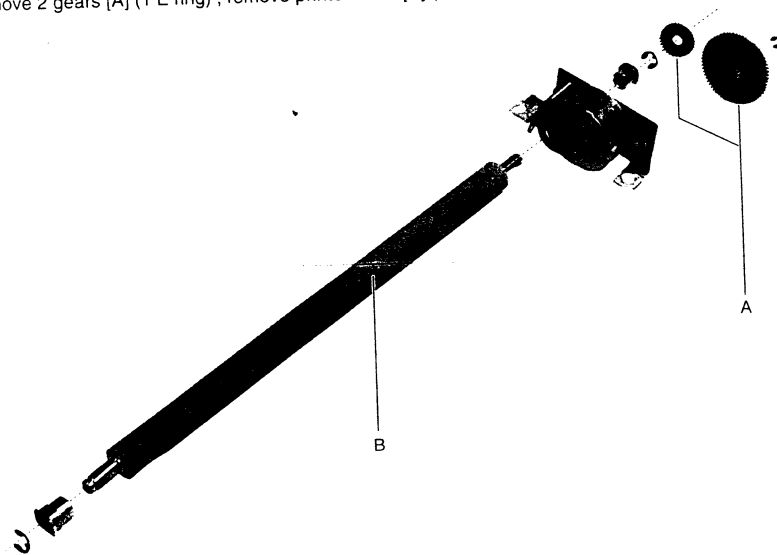
4.4.6 Rx motor

1. Remove printer roller unit (see section 4.4.6).
2. Remove gear [A], remove Rx motor [B] (2 screws, 1 E ring).



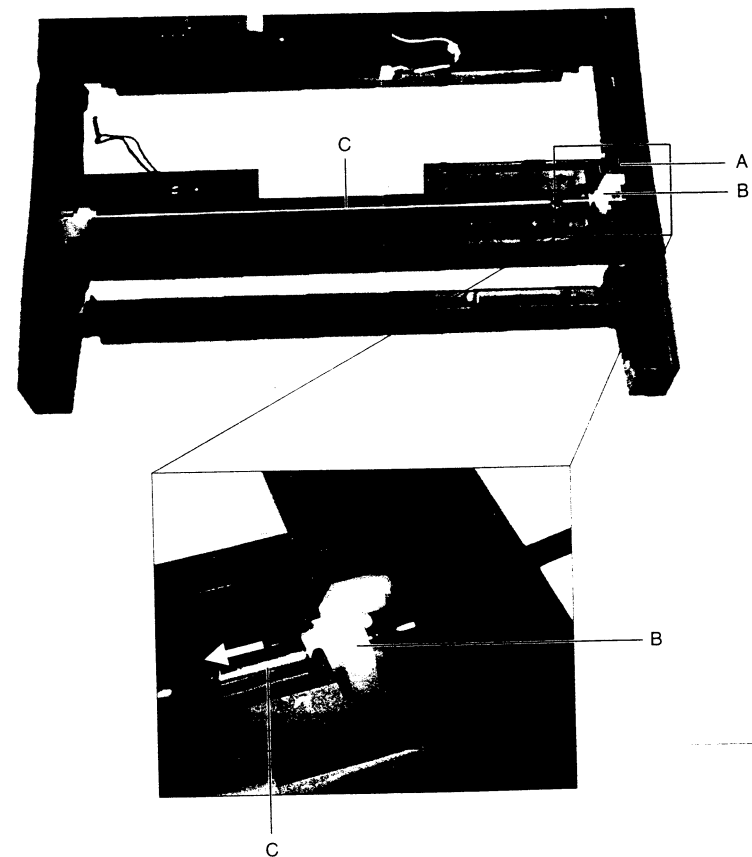
4.4.7 Printer roller

1. Remove printer roller unit (see section 4.4.6).
2. Remove 2 gears [A] (1 E ring), remove printer roller [B] (2 E rings).



4.4.8 Release shaft and release levers

1. Remove FCU (see section 4.4.2).
2. Remove printer roller unit (see section 4.4.5).
3. Remove release spring [A].
4. Lift the feather of the release lever [B] out of the groove of the release shaft [C] by using a small screwdriver, while shifting the release shaft to the left.
5. Do the same at the other side of the release shaft.
6. Remove release shaft [C].



5. TROUBLE SHOOTING

5.1 ERROR MESSAGES

Error message	Cause	Actions
NO DIALTONE	Machine can not detect the dialtone.	Try ONHOOK dialling to determine which dialtone can not be detected. Check PABX/PSTN setting. Switch off dialtone detection (see bitswitches).
NO LOOP CURRENT	No loop current detected.	Check line cable. Check TCU connectors. Check correct EEPROM settings. Replace TCU.
NO CONNECTION	Other party is either busy or does not reply.	Check with manual dialling.
REDIAL FAILED	No connection after 3 attempts.	Check with manual dialling. Try calling later.
TRANSMISSION ERROR	Too many errors during transmission.	Check the line connection. The other machine may be defect or incompatible try sending to another machine. Adjust the output level. Set BSW04 (cable length). Switch on echo cancelling (BSW04). Switch on error autoreset (BSW01).
CORDLESS ERROR	Disturbances in CTB-FCU communication.	Check connection between CTB and FCU. Check CTB EEPROM programming. Exchange CTB or FCU.
MEMORY FULL	Speed and name dial memory full.	Delete obsolete entries. Try to shorten entries.
OUT OF PAPER	End mark of thermal paper detected.	Replace paper. Clean sensor. Replace paper end sensor or FCU.
CLOSE PAPER COVER	Cover switch is not closed.	Close printer cover. Check on impurities between printer cover and base. Check cover open switch.
LOW BATTERY	Battery is nearly empty.	Check and replace battery. Replace battery cable. Replace PCU.

5.2 SERVICE REPORT

To print out the service report use service function 72 (only in service mode available !).
The meaning of error codes is listed below.

SERVICE REPORT 26-OKT-94 15:35

TIME	ERR.CODE	REMOTE MACHINE	TX/RX	PAGES	SP	RESOL.	CODING
13-OCT-94 11:17	04		R	4	72	FINE	MH
03-OCT-94 13:14	06	431601014875	T	7	24	STANDARD	MR
18-OCT-94 13:27	32	4315359748	T	1	96	STANDARD	MF
18-OCT-94 15:18	32	4315359748	T	2	96	STANDARD	MF

TIME: Date and time
 ERR.CODE: see section 5.3 for the meaning of this code
 REMOTE MACHINE: received identifier(CSI) or (if CSI is not available) the called telephone number
 TX/RX: T(= transmit), R(= receive)
 PAGES: number of pages transferred if any pixel transmission occurred
 SP: transmission speed (9600, 7200, 4800 or 2400 bps)
 RESOL.: Resolution (standard/fine)
 CODING: Modified read (MR) or Modified Huffman (MH)

5.3 ERROR CODES

This is the list of error codes which are listed in the service report.

Nr	Short description	Meaning	Cause/Action
01	PICT. QUALITY	The transmitted or received picture quality was unacceptable. Too many errors.	Check the line connection. The other machine may be defect or incompatible try sending to another machine. Ask the other party to adjust the output level. Switch on echo cancelling (BSW04).
02	TIMEOUT	The remote machine gave no answer within the specified time.	Check the line connection. The other machine may be defect or incompatible try sending to another machine. Try to adjust the output level.
03	DCN RECEIVED	The remote machine terminated the communication, possibly transmission rejected.	The other party is out of paper or has a printer jam. The other party has pressed STOP during communication.
04	LINE DISCONNECT	An expected command has not been received, possibly the line was disconnected.	Check the line connection. The other machine may be defect or incompatible try sending to another machine. Try to adjust the output level.
05	NO RESPONSE ON ALL RETRIES	The receiver did not reply the third training signal or the pixel message.	Check the line connection. The other machine may be defect or incompatible try sending to another machine. Try to adjust the output level. Check for line problems. Exchange FCU - TCU.
06	ABORTED	The transaction was aborted due to STOP key or irregular circumstances.	
08	IDENTIFICATIONS RECEIVED WHILE WAITING FOR CFR	The remote receiver did not understand our answer to its identification.	Check the line connection. The other machine may be defect or incompatible try sending to another machine. Try to adjust the output level. Check for line problems. Exchange FCU - TCU.
09	FALLBACK IMPOSSIBLE	It was not possible to send or receive an acceptable training signal.	Check the line connection. The other machine may be defect or incompatible try sending to another machine. Try to adjust the output level. Check for line problems. Exchange FCU - TCU.
10	NO LOCAL RESPONSE FOR REMOTE INTERRUPT	The remote machine issued a voice request, but the local operator did not respond.	
12	INVALID DCS	The parameter set of the remote transmitter does not correspond to our capabilities.	Clarify with other party. Try different settings of remote machine. Try to adjust the output level and/or the input sensitivity.
13	IRRELEVANT RESPONSE	The called machine responded with a wrong frame (T30 violated).	The other machine may be defect or incompatible try sending to another machine. Try different settings of remote machine.
15	INCOMPATIBLE REMOTE TRANSMITTER	It is not possible to find a common parameter set with the remote transmitter.	The other machine may be defect or incompatible try sending to another machine. Try different settings of remote machine.
22	INCOMPATIBLE REMOTE RECEIVER	It is not possible to find a common parameter set with the remote receiver.	The other machine may be defect or incompatible try sending to another machine. Try different settings of remote machine.
23	SPEED MISMATCH	The remote transmitter returned in DCS a higher scan speed than the default DIS setting.	The other machine may be defect or incompatible try sending to another machine. Try different settings of remote machine.

26	NO POST MSG	No command received following the pixel message.	Check the line connection. The other machine may be defect or incompatible try sending to another machine. Try to adjust the output level. Check for line problems. Exchange FCU - TCU.
31	COVER OPEN DETECTED	The paper cover was opened.	Check cover, check cover open switch, check connection to OPU, check connection OPU/FCU. Replace OPU or FCU.
32	COMMUNICATION PROBLEM	Communication-error which cannot be defined with any other error-code e.g.: polling request refused because polling isn't set.	Check correct settings of both machines. The other machine may be defect or incompatible. Try receiving/sending from/to another machine.
33	PIXEL RECEIVE TIMEOUT	No pixel data received within 5 seconds.	Check the line connection. The other machine may be defect or incompatible - try receiving from another machine, adjust input sensitivity. Check for line problems. Exchange FCU-TCU.
34	REMOTE REJECTED	Unauthorised caller was rejected.	
40	PAPER OUT	No paper detected or cover open detected.	Check cover, check thermal paper, check cover open switch, check/replace paper sensor, check connections to FCU, replace FCU.
41	DOCUMENT JAM	Document was longer then specified (see BSW01 bit 3/4).	Check/replace the document-in sensor, check scanner motor, check connections to FCU, replace FCU.
42	POWER OFF	The power was switched off.	For information only.
43	POWER ON	The power was switched on (as long as battery backup is available).	For information only.
44	TIME SET	System timer had been set by user.	For information only.
45	PRINT OVERHEAD	Print head overheat was detected.	Check/replace FCU.

5.4 COPY QUALITY PROBLEMS

5.4.1 Received Copies

If there is no fault in the receiving terminal or on the line but the copy quality is bad (printer test pattern is also bad) do the following:

- Clean the thermal head (use a soft cloth and alcohol).
- Check that the thermal head and the printer roller are assembled completely.
- Check the printer motor and printer gears.
- Check the cable from TPH to FCU.
- Replace the thermal head or the FCU.

5.4.2 Printouts in Copy Mode

If printouts of received fax messages (and printer test pattern) are OK but printouts made in copy mode are not, check the following:

White or black copies

- Check the scanner/sensor mechanism and adjust or replace any defective parts.
- Check connections between FCU, LED array and CCD.
- Check/replace the LED array, scanner unit or FCU.

Vertical black lines on the copy

- Clean the white roller, scanner optics and the LED array (soft cloth).
- Replace the scanner unit if there are any sharp peaks or dropouts in the CCD waveform (use service function 67 to check this).

Uneven density

- Clean the scanner roller, scanner optics and LED array (soft cloth).
- Replace the LED array or the scanner unit.

Magnification

- Check that the mirrors are assembled correctly on the scanner base.

Blurred or filled-in characters

- Clean the scanner roller, scanner optics and the LED array (soft cloth).
- Check the lens.
- Replace the scanner unit.

One side darker than the other

- Check/replace the LED array.
- Replace the scanner unit.

Image only partially scanned

- Check if the lens and the mirrors are assembled correctly on the scanner base.
- Replace the scanner unit.

5.5 PROBLEMS WITH CORDLESS PHONE(S)

5.5.1 Functionality of the cordless handset

5.5.1.1 Sounds indications on handset

Ringing melody: The handset ringing melody on request for an intercom link is different from that of an incoming call, but is chosen between 3 possible melodies (ringing melody is user selectable).

Key touch-tone: Short beep indicates a key-press (possible to deactivate).

Invalid key, wrong programming sequence and radio link failure indication: Long beep.

Confirmation of correct programming sequence: 3 different beeps.

STOP mode indication: Very long beep.

Low battery indication: 3 short beeps.

HF out of range indication: 2 short high frequency beeps.

5.5.1.2 Autonomy / Charge

The autonomy is 60 hours in idle for a CT0 set and 30 hours for a CT1(+) set and 6 hours during conversation. The total charge of the cordless handset takes 6 hours.

When the remaining autonomy for the current mode (idle or speech) gets lower than 15 minutes, a series of 5 beeps is emitted through the handset's speaker. This indication is repeated when the autonomy gets lower than 10, and 5 minutes.

When the autonomy limit is reached, a long beep is emitted, then the handset switches over to STOP mode.

When the autonomy gets under 5 minutes during ON LINE the series of beeps will be emitted more and more often until STOP mode is activated.

In addition to this timer management, a measurement is periodically made on the handsets battery. If the voltage gets lower than 3.4V (old or defective battery) the series of beeps indication an approaching STOP mode is emitted for 2 minutes; then STOP mode is activated.

5.5.1.3 Changing the battery of the cordless handset

After changing the battery of the handset:

- put it for a minimum time of 5 minutes on the charger.
- switch internal counter to an autonomy of 2 hours by pressing "PROGRAM/MUTE" key until the "TALK" key blinks; press the "INTERCOM/TRANSFER" key and enter the code corresponding to the cordless handset (see list below). The addresses 20 and 21 of handsets EEPROM contains this code!

PRODUCT (Philips)	D addr. 20/21	E addr. 20/21	F addr. 20/21	NL addr. 20/21	I addr. 20/21
Classic CT0	1273	1283	1293	1373	1383
Classic CT1(+)	1274	1284	1294	1374	1384

NOTE: Classic = Cordless handset, family A without LCD

5.5.2 Problem list

Problem	Reason	Solution
User has forgotten his locked mach code.		- Read out the match code from the CTB EEPROM (see service function 92). - Enter service mode (see section 3.1) and use for the match code BE8E .
No connection between cordless handset and fax machine.	1.) Battery of handset is empty. 2.) Handset is not matched. 3.) Too much/less distance between handset and fax machine.	1.) Put handset for 5 minutes on charger and try again. 2.) Match handset. 3.) Try with different distances between handset and fax machine.
After matching a second handset the first does not ring anymore.	Match code was locked on fax machine.	- Unlock match code on fax machine and match both handsets again. - Try to match both handsets with the locked code during one process.

5.6 FUSES

Name	PCB
F101	PSU
F201	PCU

5.7 VARIABLE RESISTORS AND SWITCHES

PCB	Name	Function
LAB	R752	Volume adjustment for the built in loudspeaker (user adjustable).
	R753	Ringer volume adjustment (user adjustable).
PSU	SW102	A thermostat which switches the power off automatically when the temperature goes higher than $\pm 5^{\circ}\text{C}$ and recovers after switching the power switch off and on or after cooling down by about 5°C .

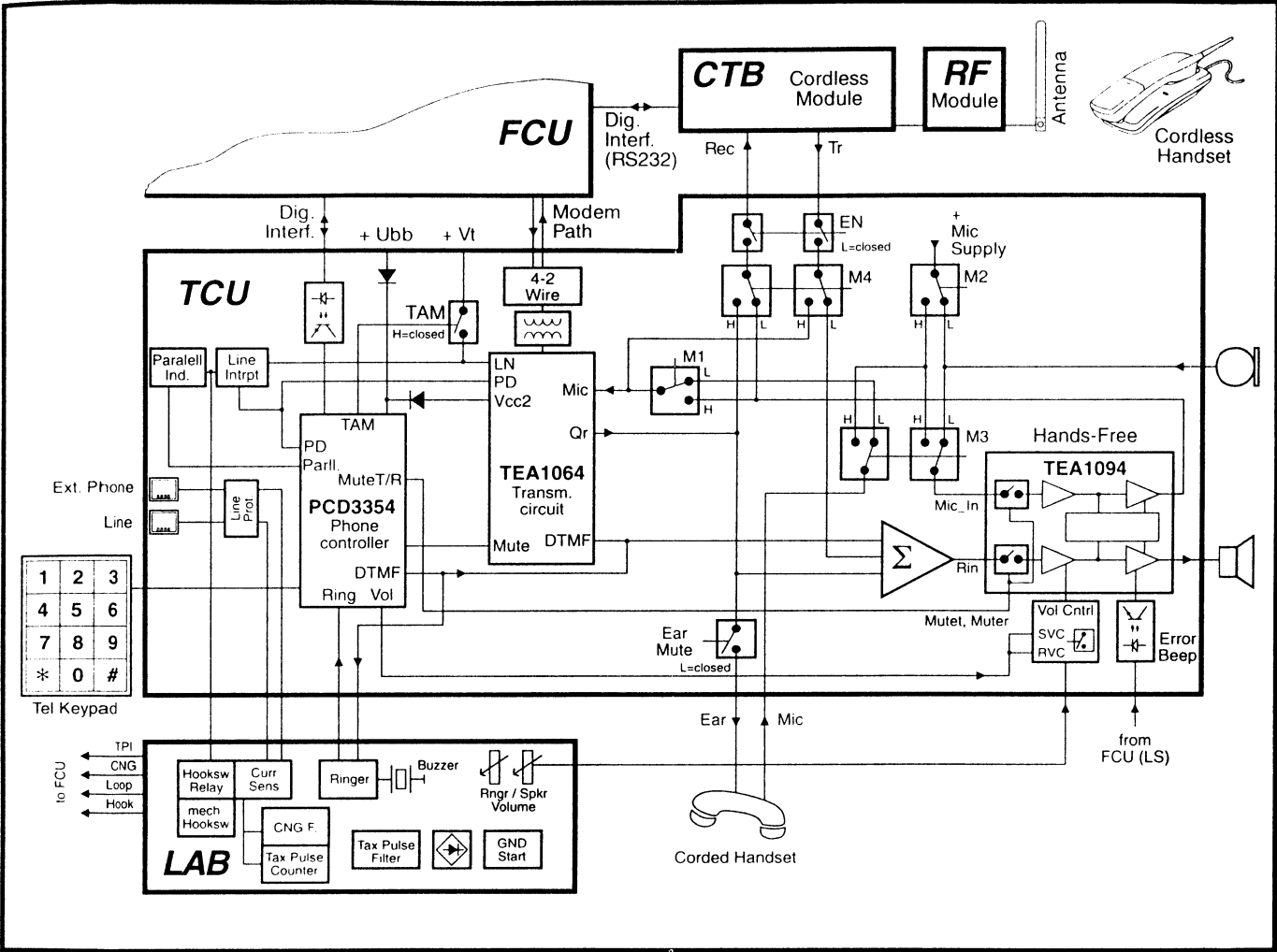
5.8 SENSORS

Name	Function
Document Sensor	Detects if a document is placed in the feeder.
Scan Line Sensor	Detects if the top of a document is at the scan line position.
Paper End Sensor	Detects if paper is in the holder.
Cover Switch	Detects if the printer cover is opened.

6.1 BLOCK DIAGRAMS



BLOCK DIAGRAM (Detail TCU / LAB)



6.2 BOARD DESCRIPTION

6.2.1 PCB Architecture

PCB name:	connected to:
FCU	Fax Control Unit
LAB	Line Access Board
TCU	Telephone Control Unit
CTB	Cordless Telephone Board
OPU	Operation Panel Unit
PCU	Power Control Unit
PSU	Power Supply Unit
SBU	Scanner Board Unit
RF-module	
	TCU, CTB, OPU, PCU, PSB, SBU
	TCU
	FCU, PCU, LAB
	FCU, TCU
	FCU, TCU
	FCU, TCU, PSU
	PCU, Mains
	FCU
	CTB, antenna

6.2.2 Description

6.2.2.1 FCU - Fax Control Unit

The Loudspeaker and microphone are not connected to the FCU. They interface directly to the TCU instead.

The major functions of the FCU are:

Fax core electronics (CPU + ASIC)

Memory block: PROM (max 512K)
SRAM (max 64K)
ARAM (max 2M)

Modem path

Scanner interface

Interface to TCU and OPU

Stepper motor drivers

Thermo print head interface

Monitor control logic

Microphone amplifier

Loudspeaker amplifier

Battery low detection

Sensor amplifiers

Clock generation

Serial interface (UART) - used as interface for the cordless part

Fax core electronics (CPU + ASIC)

The kernel of the system is built around two NSC chips, a CPU (IC402) including DSP for modem functions and the ASIC chip (IC401) including I/Os, and microwire, DRAM, interrupt and DMA controller, clock generation, address decoding, power down control and different types of interfaces to scanner, stepper motors, thermo print head, etc.

Memory

The memory block consists of two PROMs (IC480, IC481), two SRAMs (IC482, IC483) and up to four ARAMs (IC484-487). ARAMs are used for speech storage.

A 16 bit bus is used for memory accesses, PROM size may be max 512K, SRAM size 64K and ARAM size max 2MB. For ARAM memory chips with 1Mx4 internal organization are used.

Clock generation

Two oscillators are used to drive the system, the fast clock (39.3216 MHz) and a slow clock (455 kHz) for power down function (ARAM refresh for TAM operation). In power down mode the ASIC and the ARAM are supplied from the 9V block battery to establish refresh function.
The internal 32-bit counter is used for clock functionality and operates also in power down mode.

Modem interface

The modem path uses a sigma delta interface (IC501, IC502, IC504, IC505, IC506) and glue logic.

Driver interfaces

IC423, IC424 are two open collector driver chips for driving the stepper motors.

TCU / OPU interface

The interface to the TCU is a serial synchronous interface under software control of the FCU. The interface to the OPU is a combination of a serial software interface and a micro wire interface.
IC425, IC426 are driver ICs for the interfaces, mainly used to reduce EMI.

Cordless controller interface

The internal UART of the ASIC is used to interface to the cordless controller. The signal level is 5V for Rx and Tx. Optionally a hardware handshake could be used. The signals are decoupled using opto-isolators on the CTB.

Battery low detection

The battery check logic consists of TS441, TS440 and glue logic. (The battery voltage must be higher than 5,7V).

Microphone amplifier

The microphone signal is sent via the phone chip and the modem path to the FCU.

6.2.2.2 LAB - Line Access Board

The LAB is used for the following functions:

Hook switch /Hook switch relay

Ringer Circuit

Buzzer

Current Sensor

CNG filter

Tax Pulse counter

Tax Pulse filter

Earth circuit

Polarity guard

Volume Controls for Speaker and Ringer

Ringing circuit

The phone processor counts the frequency of the ringing signal and either generates a tone to the buzzer (loop powered mode) or to the loudspeaker (power up mode) and send a message to the main CPU on the FCU.

Loop Current Detection

Via the IC700 the line is monitored and a logical signal is given if line current is detected.

The LAB is connected to the TCU board (P714, P716 and P784).

6.2.2.3 TCU - Telephone Control Unit

The TCU is used for the following functions:

- Line protection and filtering
- Line break detection
- Ringing signal detection via Phone u-Controller
- Ringing signal generation via Phone u-Controller
- Detection of parallel phones
- Corded telephone part with power down function
- Listening-in/Hands Free functions in power up mode
- Analog interface for cordless part
- Modem interface to line
- Dialling functions (pulse, DTMF, flash)
- Keyboard scanning of dial keys
- Serial interface to FCU

The TCU board is the interface to the telephone line and has to fulfill all PTT requirements for different countries. Therefore many parts of this board are country specific and have to be mounted with different values. A micro controller is used for dialling functions, mode switching, keyboard scanning and is controlled via a serial interface by the FCU. In power down mode the TCU operates as a normal telephone and is powered from the PTT line.

Phone Chip TEA1064

The phone chip is the TEA1064 Philips Speech Transmission Network and is responsible for:

- 2 - to 4 - wire interface for the handset.
- Acoustic adjustments like frequency response and level for the transmission and receive part
- DC characteristic of the device (with R847).
- AC characteristic (Return Loss) of the device (with R821, R822, C804).
- Feeding the DTMF signals that are generated from the phone processor IC807 to the line.
- Adjustments can be done with C832, R853, and R854.
- Supply for powering peripheral circuits in power down mode.

The fax signals are coupled to the line via the decoupling transformer T803, which is also the high voltage barrier between the phone and the digital part of the unit.

Listening-in/Hands Free

For this function the TEA1093 (Philips Hands Free Network) is used.
It incorporates:

- Microphone channel with:
 - adjustable gain, frequency response and mute function.
- Loudspeaker channel with:
 - adjustable gain, frequency response, mute function, dynamic limiter, logarithmic volume control,
- Bridge output amplifier for loudspeaker.
- Duplex controller for both channels with:
 - external adjustable sensitivity and time constant, noise monitoring, dial tone detector.

Phone Processor

The phone processor is a mask programmed Philips PCD3354 micro controller which is responsible for:

- Serial interface to the main board (FCU) via optoisolators OC800 to OC802.
- Country specific timings. Read out country code from built in EEPROM.
- Generates DTMF signals.
- Controls the phone chip IC800, Hands Free chip IC806 and analog switches IC803 to IC805.
- Checks for correct ringing signals.
- Controls the pulse dialling (if available).
- Controls the On - Off - Hook Dialling (FET TS800).
- Controls the current change during pulse dialling (TS811).
- Controls the Flash timing.
- Controls the Earth timing and close the Earth loop with TS711 or TS714.
- Scans the numerical Keypad.
- Controls Hook Switch Relay.
- Generates ringing melodies.
- Checks for parallel telephone.

NOTE: The Phone Processor is mask programmed, there is no way to change the programming !

6.2.2.4 OPU - Operation Panel Unit

- Keyboard scanning
- Driving the LCD display
- Driving the LED's
- Micro wire interface to FCU

The OPU has a micro controller (COP820) with a serial interface to the FCU. All functions are performed by this micro controller.

LCD Display

A standard 16 character LCD display is used.

The OPU-PCB is only the carrier for the cover switch which is connected directly to the FCU.

6.2.2.5 PCU - Power Control Unit

The PCU is used for the following functions:

- Input voltage +24V / 6A
- Output voltage generation:
 - +5V / 800 mA
 - +12V / 50 mA
 - +24V / 4 A
 - 12V / 50 mA
- Supply voltage for
 - ASIC: 5V / 200 mA
 - CPU: 5V / 200 mA
 - ARAM: (buffered by 9V battery) 5V / 20 mA
- Supply voltage for SRAM (buffered by a 3V lithium battery) 5V / 200 mA
- Supply voltages for TCU, CTB, RF-Part 5V / 220 mA
- Power fail signal generation
- Over voltage protection and filtering, reverse voltage protection
- FET switch for thermo print head supply (24V/4A peak)

General

The machine is supplied from an external PSU with a single output voltage of +24V (+/-5%). But the electronic circuits in the fax machine need to be supplied with:

- +24V (Stepper motors, scanner illumination)
- +24V with low impedance high-side switch (for printhead)
- +5V (Digital circuits, sensors, Modem, ...)
- +12V and -12V (analog circuits)

In addition, it is necessary to provide a 1.5 kV AC isolated +5V supply for the line interface unit and some power-fail and battery backup circuits. All these functions are implemented on the PCU.

Input protection of PCU

For protection against any overvoltage at the input, there is a crowbar circuit (TY201) and the fuse F201.

DC/DC converter, +5V(=VCC) generation

The converter basically consists of a controller (IC210), a coil (TR210), input and output capacitor (C210/C214) and the freewheeling diode (D210). Its operation can be described as follows:

+24V Power High Side Switch

In this facsimile machine, a thermal printhead is used for printing. This device operates at +24V; but if it is not operated, the supply has to be switched off. The reason is the lifetime of the printhead. There are two major problems for the switch:

- the high printhead current (4A max.)
- it has to be a high-side switch (printhead specification)

The switching is done by a N-channel MOSFET (TS270) with low ON-resistance.

Undervoltage detection

This circuit monitors the major supply voltages and generates an active low, open collector power-fail signal, if one (or more) supply goes down. This signal (PFAIL) is connected to the FCU and forces the CPU to go to the low-power standby mode. "Power-fail" is detected, if either VCC is goes below 4.6V or the +24V input drops to 16V. In case of +24V drop, the PFAIL signal goes low about 2 ms (at typical load) before VCC falls out of tolerance.

Static RAM backup

In the moment VCC drops below 4.6V, the static RAM supply is disconnected from the common VCC and switched over to the lithium battery instead. This makes sure that the data stored in the SRAM can not be lost in any case of power-fail. The lithium battery backup is designed to keep the SRAM alive for five years (typical value without power-on).

Dynamic RAM backup

If VCC drops below 4.6V (usually because of power-down), the dynamic RAM supply is switched over to the 9V battery backup circuit without any interruption. The +9V battery backup is designed to keep stored messages of the TAM for 72 hours in power-down state (typical for alkaline battery). If the +9V battery is discharged, the messages are lost; only the static RAM remains stored.

6.2.2.6 PSU - Power Supply Unit

The PSU is a flyback converter which essentially consists of dc voltage source, transformer, switch, rectifier and load. It generates +24V from the mains power supply.

6.2.2.7 SBU - Scanner Board Unit

Interface to CCD

Video signal generation

The SBU board converts the signal of the CCD to a video signal which is passed to the scanner interface on the FCU.

This board is located on the scanner assembly and its position adjusted and sealed in the factory such that the desired image of the document to be transmitted or copied is projected on the CCD sensor.

6.2.2.8 CTB - Cordless Telephone Board

The CTB is the interface between the Fax-unit (Basestation) and the cordless handsets.

It manages the link to the mobile handsets as setting up a connection, ringing, call transfer and more.

The CTB has several different interfaces to the Fax-machine:

Power is supplied by the PCU.

The FCU exchanges control and status information works via an optically isolated serial link (1200 Baud) with the CTB's micro controller.

The analog (voice) in- and output is directly fed into the analog path of the TCU.

The main function blocks of the CTB are:

Microcontroller (Motorola 68HC05) - handles the protocol of the RF-link to the mobile Handsets.

Digital Control Interface to FCU.

Analog signal conditioning which uses an audio compander, is required to reduce noise and to improve the dynamic range of the voice signals exchanged by the RF-link on one side and the analog interface to the TCU on the other.

6.2.2.9 RF Module

A metal-shielded tuner unit which operates at the frequencies required for the different systems:

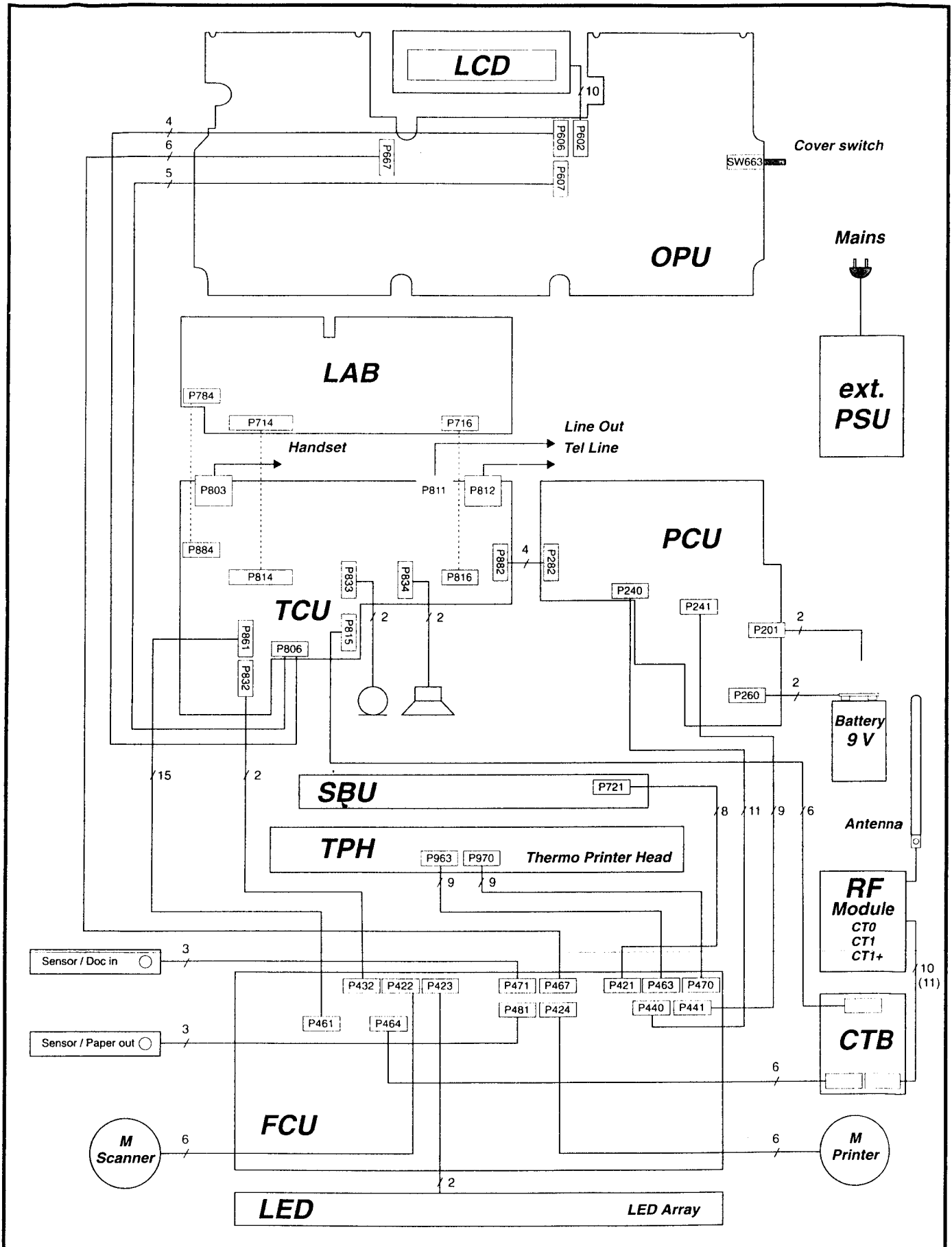
CT0: 46,46 Mhz at 10 channels

CT1: 914,0125 Mhz, and 959,0125 Mhz at 40 channels

CT1(+): 914,0125 Mhz, and 959,0125 Mhz at 80 channels

This part includes all RF-electronics together with the channel selection (synthesizer) and has a digital interface for control, an analog interface for voice and signal strength indication and the outlet for the antenna.

6.3 WIRING DIAGRAM



6.4 INTERCONNECTION LIST

6.4.1 CONNECTIONS FROM FCU

V ... voltage at that pin after power on, machine is connected to tel line and off hook

C ... clock signal

L ... phone line potential

A ... analog signal

nc... not connected

NOTE: All measures should be done between the required pin and the reference potential (reference potential pin is printed bold).

P421 FCU - SBU

8pin
color: white

NO	NAME	FUNCTION	V
1	VIN	Scan data in	A
2	DGND	Digital ground	0
3	SDIS	Scan data in strobe	C
4	SLS	Scan line strobe	C
5	SCLKI	Scan clock	C
6	nc		
7	S +12 V	Power	12
8	SVCC	Power	5

P422 FCU - Tx Motor

6pin
color: white

NO	NAME	FUNCTION	V
1	SMPH A	Tx motor phase A drive	24
2	SMPH A	Tx motor phase A drive	24
3	SMPH B	Tx motor phase B drive	24
4	SMPH B	Tx motor phase B drive	24
5	+24 V	Power	24
6	+24 V	Power	24

P423 FCU - LED-Array

2pin
color: blue

NO	NAME	FUNCTION	V
1	+24 V	Tx motor phase A drive	24
2	LEDON	LED bar enable	0

P424 FCU - Rx Motor

6pin
color: white

NO	NAME	FUNCTION	V
1	PMPH A	Rx motor phase A drive	24
2	PMPH A	Rx motor phase A drive	24
3	PMPH B	Rx motor phase B drive	24
4	PMPH B	Rx motor phase B drive	24
5	+24 V	Power	24
6	+24 V	Power	24

P432 FCU - TCU

2pin
color: white

NO	NAME	FUNCTION	V
1	DGND	Digital ground	0
2	LOUD	Buzzer signal	0

P440 FCU - PCU

11pin
color: white

NO	NAME	FUNCTION	V
1	TPHON	TPH enable	5
2	-15 V	Power	-15
3	AGND	Analog ground	0
4	+12 V	Power	12
5	VCC	Power	5
6	PVCA	Power ARAM (5 V when power off)	5
7	DGND	Digital ground	0
8	DGND	Digital ground	0
9	PVCS	Power SRAM (3 V when power off)	5
10	+9 V	Power	9
11	PFail	Power fail signal	5

P441 FCU - PCU

9pin
color: yellow

NO	NAME	FUNCTION	V
1	+24 V	Power	24
2	HGND	High power ground	0
3	HGND	High power ground	0
4	HGND	High power ground	0
5	HGND	High power ground	0
6	24SW	TPH power, switched by TPHON	0
7	24SW	TPH power, switched by TPHON	0
8	24SW	TPH power, switched by TPHON	0
9	24SW	TPH power, switched by TPHON	0

P461 FCU - TCU

15pin
color: white

NO	NAME	FUNCTION	V
1	VCC	Power	5
2	+24 V	Power	24
3	LCLK	Serial interface clock	C
4	LSOD	Serial data to Tel. controller	C
5	DGND	Digital ground	0
6	LSID	Serial data from Tel. controller	C
7	TPI	Tax pulse indicator	0
8	MOD-ON	Loop current indicator	0
9	LOOP	Line signal to detect CNG tone	A
10	CNGTONE	Modem receive data	A
11	MRxD	Analog ground	0
12	AGND	Modem transmit data	A
13	MTxD	Power	-12
14	-12 V	Power	12
15	+12 V	Power	12

P463 FCU - TPH

9pin
color: blue

NO	NAME	FUNCTION	V
1	DI	Print data	0
2	LAT	Print data latch signal	5
3	CLKTPH	CLK for TPH	5
4	-STB4	4. strobe signal	5
5	-STB3	3. strobe signal	5
6	-STB2	2. strobe signal	5
7	-STB1	1. strobe signal	5
8	TM2	Thermistor	A
9	TM1	Ground	0

P464 FCU - CTB

6pin
color: black

NO	NAME	FUNCTION	V
1	VCC	Power	5
2	URxD	RxD signal	5
3	UTxD	TxD signal	5
4	UTEN	CTS signal	5
5	UREN	RTS signal	5
6	DGND	Digital ground	0

P467 FCU - OPU

6pin
color: blue

NO	NAME	FUNCTION	V
1	SCO	Cover open signal (H: Cover open)	0
2	DGND	Digital ground	0
3	VCC	Power	5
4	OPUSOD	Serial data to OP controller	C
5	OPUSID	Serial data from OP controller	C
6	OPUSCK	Serial clock	C

P470 FCU - TPH

9pin
color: white

NO	NAME	FUNCTION	V
1	PVCC	Power	5
2	DGND	Ground	0
3	DGND	Ground	0
4	DGND	Ground	0
5	DGND	Ground	0
6	24SW	TPH power, switched by TPHON	0
7	24SW	TPH power, switched by TPHON	0
8	24SW	TPH power, switched by TPHON	0
9	24SW	TPH power, switched by TPHON	0

P471 FCU - SDI (Document in sensor)

3pin
color: blue

NO	NAME	FUNCTION	V
1	SDION	Sensor enable drive (L: enable)	5
2	VCSDI	Power	5
3	SDI	Document in signal (L: Document in)	5

P481 FCU - SOP (Paper out sensor)

3pin
color: white

NO	NAME	FUNCTION	V
1	SOPON	Sensor enable drive (L: enable)	5
2	VCSOP	Power	5
3	SOP	Paper out signal (L: Paper out)	5

6.4.2 CONNECTIONS FROM TCU**P803 TCU - Handset**

4pin

NO	NAME	FUNCTION	V
1	MIC-	Microphone -	A
2	EAR-	Speaker -	A
3	EAR+	Speaker +	A
4	MIC+	Microphone +	A

P806 TCU - OPU

9pin
color: white

NO	NAME	FUNCTION	V
1	COL1	key polling signal out 1	C
2	COL2	key polling signal out 2	C
3	COL3	key polling signal out 3	C
4	COL4	key polling signal out 4	C
5	COL5	key polling signal out 5	C
6	COL6	key polling signal out 6	C
7	ROW1	key pressed input 1	C
8	ROW2	key pressed input 2	C
9	ROW3	key pressed input 3	C

P811 TCU - Line out

6pin

NO	NAME	FUNCTION	V
1	nc		
2	nc		
3	LA2	External phone tip	L
4	LB2	External phone ring	L
5	EARTH	Tel ground	L
6	nc		

P812 TCU - Line

6pin

NO	NAME	FUNCTION	V
1	nc		
2	LA2	External phone tip	L
3	LA	Phone tip	L
4	LB	Phone ring	L
5	LB2	External phone ring	L
6	EARTH	Tel ground	0

P814 TCU - LAB Connector

6pin

NO	NAME	FUNCTION	V
1	RTE	Ringer enable	0
2	DTMF	Ringer signal	A
3	VCC-U	Power for TEL processor	5
4	VBB+	Power supply	5
5	RING	Ringer detection signal	0
6	GS	Earth start control	5
7	SLOPE	Analog telephone ground	0
8	INTHK	Mechanical hook switch recognize (= 0 if handset is not lifted)	0
9	TEL+	Positive line wire	L
10	TEL-	Negative line wire	L
11	TEL_VOL	Connection to speech volume control potentiometer	A
12	RING_VOL	Connection to ringer volume control potentiometer	A
13	ELHSW	Electrical hook switch	0
14	CNG	CNG signal	A
15	CNG_SW	CNG switch	0

P815 TCU - CTB

6pin
color: white

NO	NAME	FUNCTION	V
1	CL-R	Receive wire	A
2	SLOPE	Analog telephone ground	0
3	CL-TR	Transmit wire	A
4	nc		
5	SLOPE	Analog telephone ground	0
6	VBB+	Power supply from PCU	5

P816 TCU - LAB Connector

5pin
color: white

NO	NAME	FUNCTION	V
1	LA	Phone tip	L
2	LB	Phone ring	L
3	EARTH	Tel ground	0
4	LA2	External phone tip	L
5	LB2	External phone ring	L

P832 TCU - FCU / see FCU - TCU

2pin
color: white

P833 TCU - Microphone

2pin
color: blue

NO	NAME	FUNCTION	V
1	FM+	Microphone +	A
2	FM-	Microphone -	A

P834 TCU - Loudspeaker

2pin
color: white

NO	NAME	FUNCTION	V
1	LS -	Loudspeaker -	A
2	LS+	Loudspeaker +	A

P861 TCU - FCU / see FCU - TCU

15pin
color: white

P882 TCU - PMU

4pin
color: white

NO	NAME	FUNCTION	V
1	VBB+	Power for handsfree, cordless functions	5
2	VBB-	Ground	0
3	VT+	Telephone voltage	7
4	VT-	Ground	0

P884 TCU - LAB Connector

4pin
color: white

NO	NAME	FUNCTION	V
1	DGND	Digital ground	0
2	VCC	Power	5
3	LOOP	Loop current detection	0
4	TPI	Tax pulse input	0

6.4.3 CONNECTIONS FROM PCU**P201 PCU - PSU**

3pin
color: black

NO	NAME	FUNCTION	V
1	+25 V	power from PSU	25
2	GND	Ground	0
3	GND	Ground	0

P240 PCU - FCU / see FCU - PCU

11pin
color: white

P241 PCU - FCU / see FCU - PCU

9pin
color: yellow

P260 PCU - Batterie

2pin
color: white

NO	NAME	FUNCTION	V
1	+BAT	Power from battery	9
2	DGND	Digital ground	0

P282 PCU - TCU / see TCU - PCU

4pin
color: white

6.4.4 CONNECTIONS FROM OPU**P602 OPU - LCD**

10pin
color: white

NO	NAME	FUNCTION	V
1	DB3	Display data	C
2	DB2	Display data	C
3	DB1	Display data	C
4	DB0	Display data	C
5	E	Enable clock	C
6	RW	Read/Write	C
7	RS	Register select	C
8	VDIS	Contrast voltage	0-5
9	VCC	Power	5
10	DGND	Digital ground	0

P606 OPU - TCU / see TCU - OPU

4/5pin
color: white

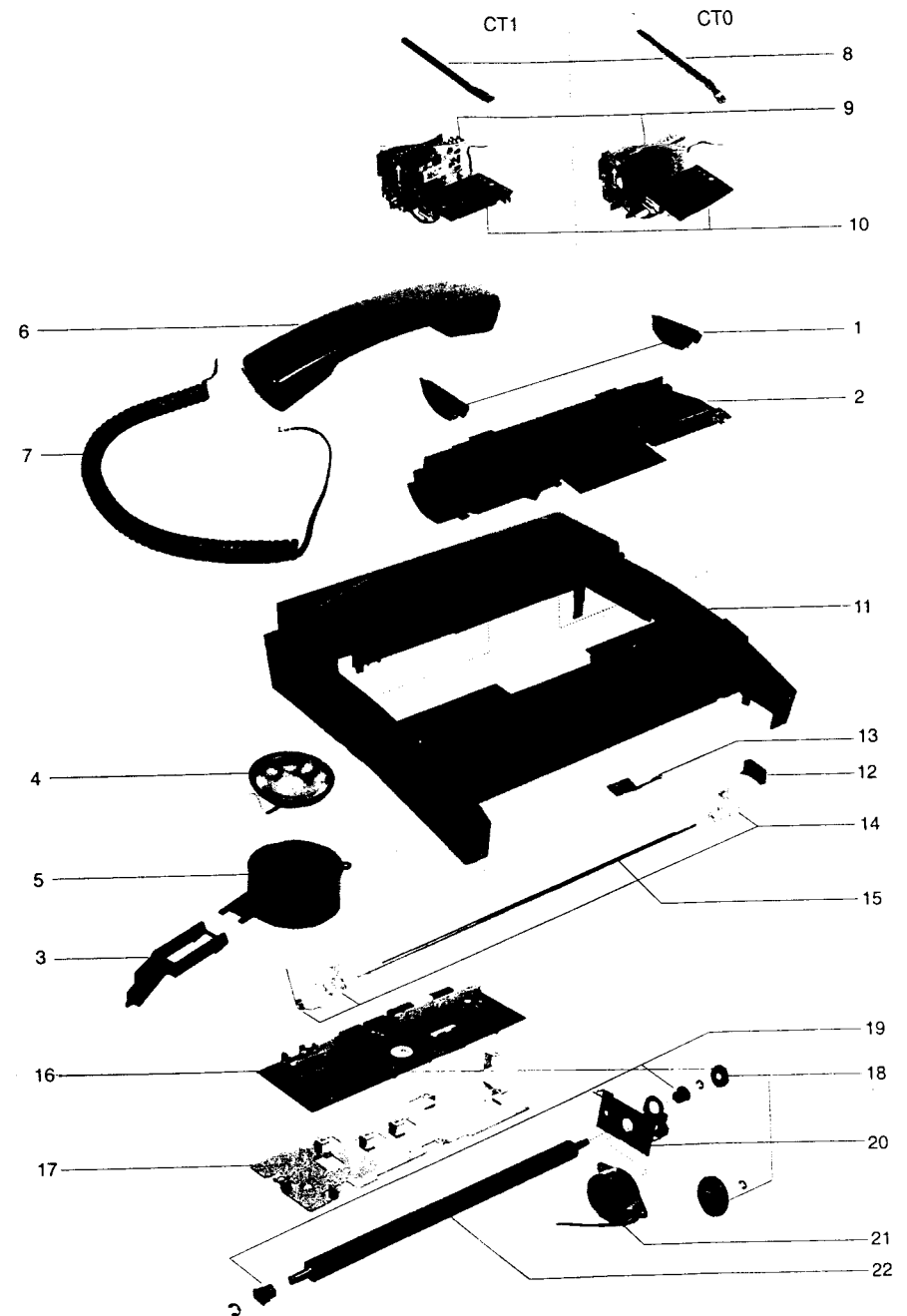
6.4.5 CONNECTIONS FROM PSU**P101 PSU - PCU / see PCU - PSU**

PSU - Power Plug / Power Switch
AC voltage from wall outlet

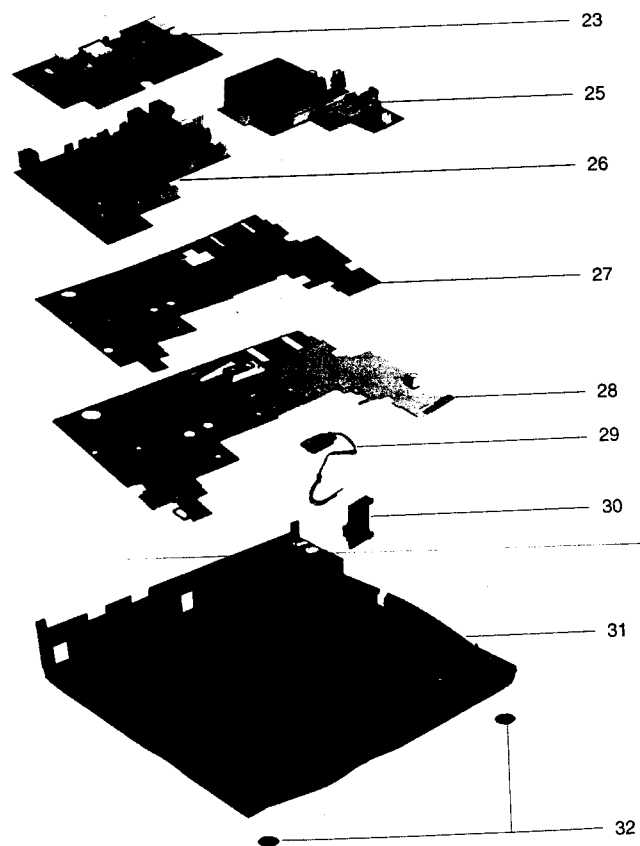
7. PARTS LIST

7.1 MECHANICAL PARTSLIST

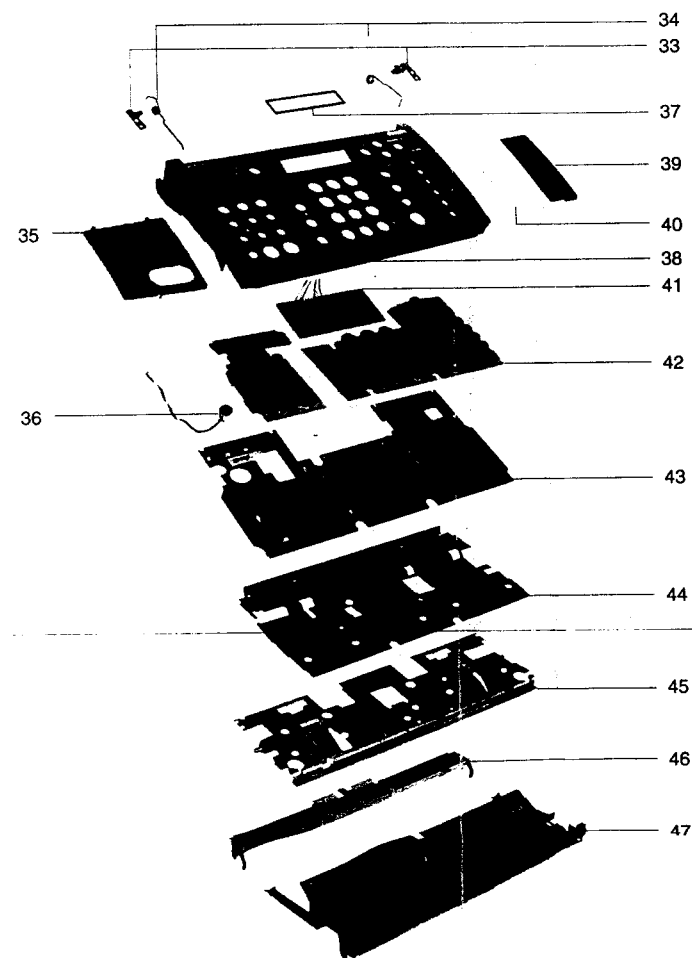
NR.	DESCRIPTION	REMARKS	SERVICE CODE
1	Distance plate		4822 466 93272
2	Paper holder		4822 256 92088
3	Hookswitch lever		4822 404 60799
4	Loudspeaker		4822 240 30731
5	Cover loudspeaker		4822 432 40312
6	Handset		4822 432 40264
7	Handset cord		4822 321 62118
8	Antenna - base / A	CT1	4822 303 30455
8	Antenna - base / I	CT1	4822 303 30455
8	Antenna - base / B	CT1	4822 303 30455
8	Antenna - base / D	CT1	4822 303 30455
8	Antenna - base / NL, F	CT0	4822 303 30465
8	Rubber antenna - base / NL, F	CT0	4822 303 30466
9	RF-Module / A; PCB	CT1	4822 212 60358
9	RF-Module / B; PCB	CT1	4822 212 60308
9	RF-Module / I; PCB	CT1	4822 212 60358
9	RF-Module / D; PCB	CT1	4822 212 60308
9	RF-Module / NL; PCB	CT0	4822 212 60336
9	RF-Module / F; PCB	CT0	4822 212 60335
10	CTB / D; PCB	CT1	4822 212 60338
10	CTB / B; PCB	CT1	4822 212 60356
10	CTB / A; PCB	CT1	4822 212 60357
10	CTB / I; PCB	CT1	4822 212 60335
10	CTB / NL; PCB	CT0	4822 212 60337
10	CTB / F; PCB	CT0	4822 212 60334
11	Top Cover		4822 432 40311
12	Release button		4822 410 62764
13	SOP; PCB		4822 212 60267
14	Release shaft		4822 535 93419
15	Release lever set		4822 404 21268
16	FCU; PCB	10 min. TAM	4822 212 60339
17	Shielding plate / FCU		4822 466 83024
18	Printer gear set		4822 522 33386
19	Bearing set - Printer roller		4822 520 30552
20	Printer gear bracket		4822 466 83026
21	RX motor		4822 361 21651
22	Printer roller		4822 528 70828



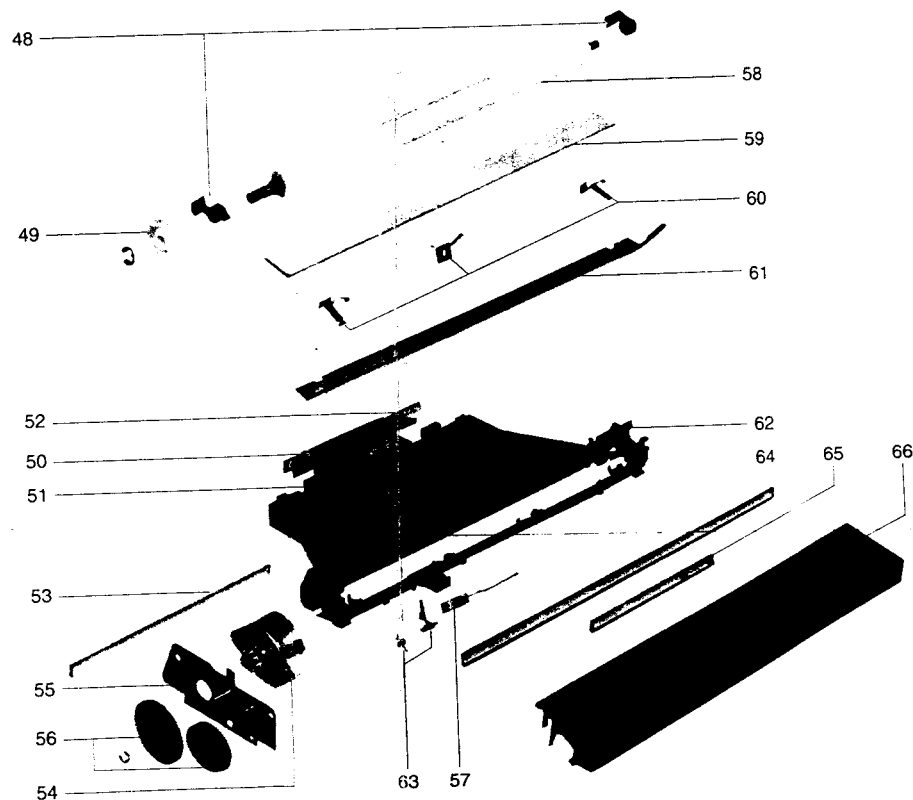
NR.	DESCRIPTION	REMARKS	SERVICE CODE
23	LAB / D; PCB		4822 212 60342
23	LAB / NL; PCB		4822 212 60344
23	LAB / B; PCB		4822 212 60354
23	LAB / I; PCB		4822 212 60349
23	LAB / F; PCB		4822 212 60347
23	LAB / A; PCB		4822 212 60352
25	PCU / CH; N; PCB		4822 212 60343
25	PCU / I, B, NL, D, F, A; PCB		
26	TCU / D; PCB		4822 212 60341
26	TCU / NL; PCB		4822 212 60345
26	TCU / B; PCB		4822 212 60353
26	TCU / I; PCB		4822 212 60348
26	TCU / F; PCB		4822 212 60346
26	TCU / A; PCB		4822 212 60351
27	Isolation plate / TCU-PCU		4822 466 62605
28	Metal shield / TCU-PCU		4822 466 83162
29	Battery cable		4822 321 62796
30	Battery cover		4822 432 40313
31	Bottom cover		4822 432 40317
32	Rubber foot		4822 462 42144



NR.	DESCRIPTION	REMARKS	SERVICE CODE
33	Bearing bracket set		4822 404 21269
34	Holding spring set		4822 492 42676
35	TAM key cover		4822 432 40263
36	Microphone		4822 212 60278
37	Window operation panel		4822 432 40314
38	Operation panel cover / D, A	for D, A	4822 432 40315
38	Operation panel cover / UK	for I, B	4822 432 40316
38	Operation panel cover / F		
39	Window speed dial keys		4822 450 62107
40	Paper label speed dial		
41	LCD module		4822 130 91266
42	Rubber mat		4822 410 62766
43	Operation panel; PCB		4822 212 60269
44	Isolation plate OPU		4822 466 93271
45	Thermal head holder		4822 466 83033
46	Thermal print head; assy		4822 282 40271
47	Paper guide		4822 432 40261



NR.	DESCRIPTION	REMARKS	SERVICE CODE
48	Scanner bearing set		4822 404 21271
49	Gear scanner roller		4822 522 33385
	Scanner unit	Contains all parts marked with S	4822 212 60281
50	Lens Holder	S	
51	Lens	S	
52	SBU; PCB	S	4822 380 30321
53	Mirror medium		4822 361 21652
54	TX motor		4822 404 60774
55	Scanner gear bracket		4822 522 33387
56	Gear set scanner	S	4822 212 60265
57	SDI; PCB		4822 528 70827
58	Scanner roller		4822 466 70755
59	Glass plate	S	4822 492 71398
60	Scanner spring set	S	4822 212 60273
61	LED array	S	4822 464 90788
62	Scanner base		4822 130 83463
63	Lever set, paper sensor	S	4822 380 30318
64	Mirror long	S	4822 380 30319
65	Mirror short		4822 432 40309
66	Scanner cover		



7.2 ELECTRICAL PARTSLIST

NR.	DESCRIPTION	REMARKS	SERVICE CODE
	PSU; PCB		4822 212 60274
			4822 321 62769
	Cable PCU - FCU (9 pins)		4822 321 62768
	Cable PCU - FCU (11 pins)		4822 321 62791
	Cable PCU - TCU (4 pins)		4822 321 62789
	Cable FCU - TCU (15 pins)		4822 321 62792
	Cable FCU - TCU (2 pins)		4822 321 62794
	Cable FCU - CTB (6 pins)		4822 321 62787
	Cable FCU - TPH (9 pins)	blue	4822 321 62788
	Cable FCU - TPH (9 pins)	white	4822 321 62775
	Cable OPU - FCU / TCU (4/5 pins; 6 pins)		4822 321 62797
	Cable OPU - LCD (10 pins)		4822 321 62793
	Cable TCU - CTB (6 pins)		4822 321 62795
	Cable RF module - antenna	CT1	
	Foil cable RF module - CTB / D, A, B, I	CT1	
	Foil cable RF module - CTB / NL, F	CT0	
			4822 321 61162
	Telephone cord / D		4822 321 62431
	Telephone cord / NL		4822 321 62187
	Telephone cord / B, P		4822 321 62493
	Telephone cord / I		4822 321 61166
	Telephone cord / A		4822 321 62685
	Telephone cord / F		
			4822 321 14018
	Power cord / EU		4822 321 11096
	Power cord / UK		4822 321 22554
	Power cord / CH		
		2 ROMs	4822 900 10588
FCU	ROM set / D	2 ROMs	4822 900 10589
	ROM set / NL	2 ROMs	4822 900 10591
	ROM set / B	2 ROMs	4822 900 10592
	ROM set / I	2 ROMs	4822 900 10593
	ROM set / F	2 ROMs	4822 900 10594
	ROM set / A	2 ROMs	
			4822 265 31115
LIU	Modular jack 4 p		4822 267 40989
	Modular jack 6 p		4822 209 33412
	TEA 1064		
			4822 138 10583
PMU	Lithium battery		4822 254 10026
	fuse		4822 209 60403
	DC-DC converter, IC210		
	OTHERS		
			4822 736 22298
	User Manual / A, D		4822 736 22295
	User Manual / NL, B		4822 736 22296
	User Manual / F		